Mining CONGRESS JOURNAL

AMERICAN MINING CONGRESS

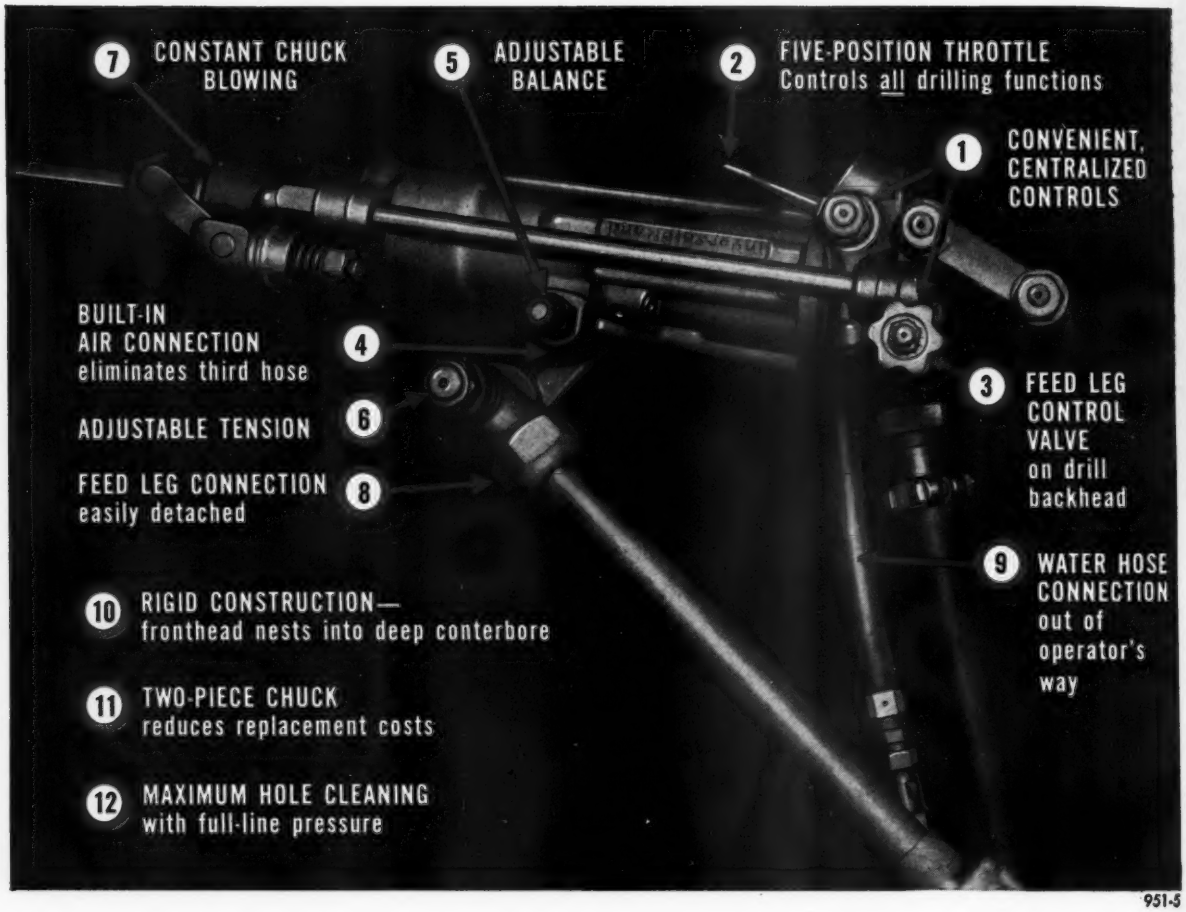
AMC

MARCH 1954

JACKDRILL FEATURES

that add up to

MORE TONNAGE PER SHIFT!



951-5

The advantages of a Jackleg type of drill are now so well established that you should buy the best available design for the job. Collectively the Ingersoll-Rand JR-38 Jackdrill design features make it the fastest drilling, easiest handling one-man drifter unit ever developed.

The JR-38 is not a Jackhamer-Jackleg combination but a completely integrated Jackleg Drill—designed to take full advantage of faster, easier-drilling Carset Jackbits. Use it as a drifter—as a stoper—as a Jackhamer. Its flexibility, ease of handling and simplicity of control pleases owners and operators alike.

Ask your Ingersoll-Rand representative for complete information on the new JR-38. Or write for your copy of Bulletin 4144.

Ingersoll-Rand

11 BROADWAY, NEW YORK 4, N. Y.

COMPRESSORS • AIR TOOLS • ROCK DRILLS • TURBO BLOWERS • CONDENSERS • CENTRIFUGAL PUMPS • DIESEL AND GAS ENGINES

BECAUSE of their outstanding design and efficient performance in the field, Nordberg mine hoists have been chosen by another large copper corporation to meet the exacting specifications for its Arizona copper operation. The reasons behind the selection of three Nordberg 15′ dia. double drum hoists are sound . . . since 1895 Nordberg has held the reputation for leadership in the large hoist field—these hoists are used by major mining companies throughout the world. What's more, Nordberg has been the source of the most progressive hoist engineering advances in the mining industry.

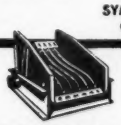
No matter what *your* hoisting requirements may be, you will find that Nordberg hoist engineers are fully qualified to solve your specific problems. Write for further details, or send for Bulletin 190.

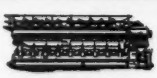
SYMONS . . . A REGISTERED NORDBERG TRADEMARK KNOWN THROUGHOUT THE WORLD


SYMONS GYRATORY CRUSHERS


SYMONS CONE CRUSHERS


GRINDING MILLS


SYMONS VIBRATING GRIZZLIES and SCREENS


DIESEL ENGINES

NORDBERG MFG. CO., Milwaukee, Wisconsin

M353

NORDBERG

MACHINERY FOR PROCESSING ORES and INDUSTRIAL MINERALS

NEW YORK • SAN FRANCISCO • DULUTH • WASHINGTON
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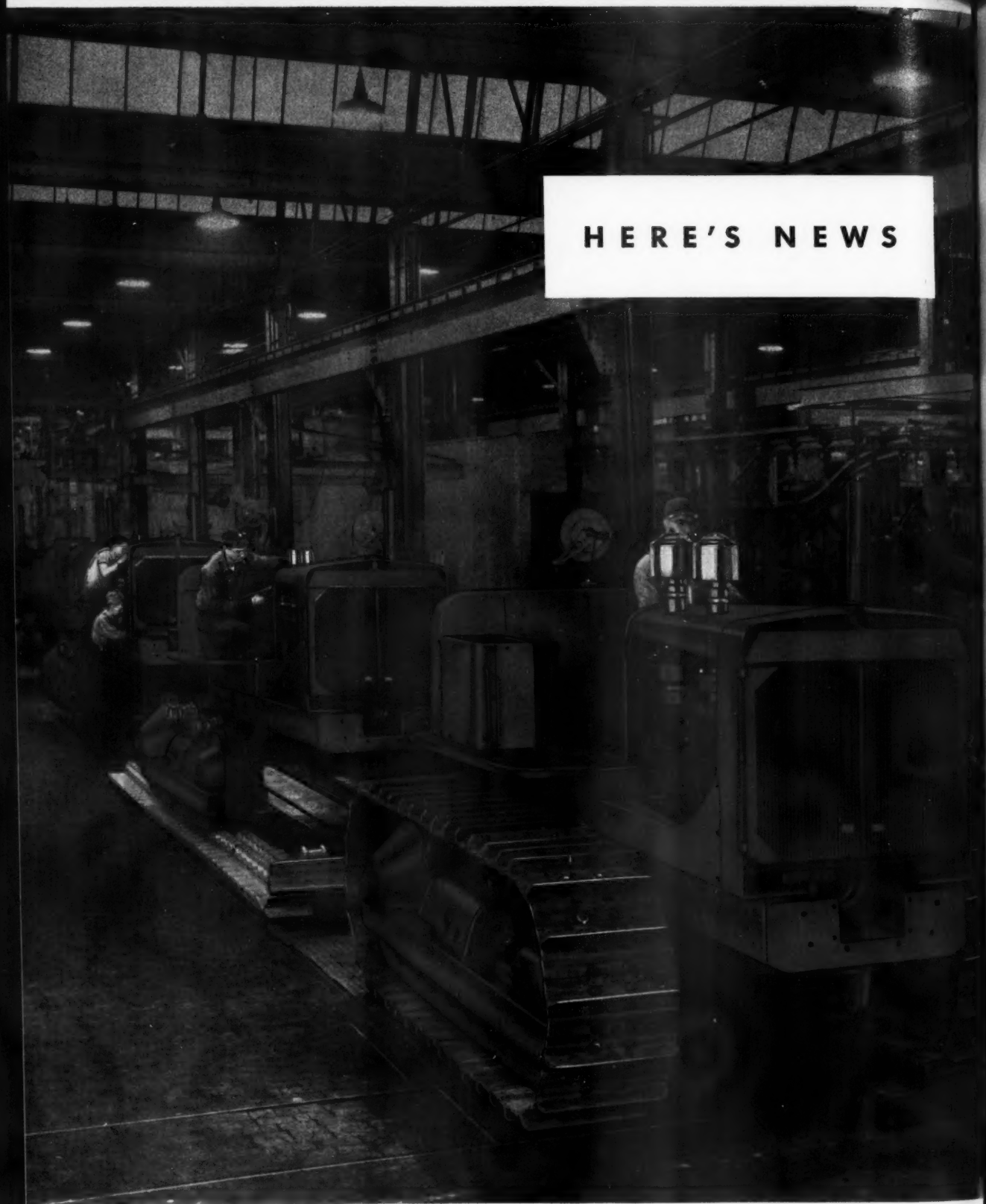

They're here now! **28,000-lb. HD-15's with torque converter drive are already rolling off the assembly line.**

Allis-Chalmers Powerful HD-15 adds to its big work advantages

. . . now offers choice of two outstanding drives— standard transmission with time-saving shift pattern, or widely accepted hydraulic torque converter drive

From its introduction, the Allis-Chalmers HD-15 has set new standards in performance and long-life service . . . in a new size class. It combines outstanding strength and balance with plenty of power, plus a simplified, time-saving transmission that gives big work output. In addition, the HD-15 offers remarkable service simplicity, with features like unit assembly and 1,000-hour lubrication intervals for truck wheels, idlers, and support rollers. It has proved itself the kind of tractor required on today's jobs.

Now, hydraulic torque converter drive is added as optional equipment — an additional working advantage for the powerful HD-15. This advanced design drive was introduced by Allis-Chalmers in the world's *first* torque converter tractor nine years ago. This modern drive gets more done because it automatically provides the right combination of speed and pull every working minute . . . and hydraulic cushioning assures longer life for both tractor and auxiliary equipment.

Now you can choose the HD-15 with standard transmission *or* hydraulic torque converter drive. Either way you'll be getting the most advanced tractor in the business. Let your Allis-Chalmers dealer give you *all* the reasons why.

ALLIS-CHALMERS
TRACTOR DIVISION • MILWAUKEE 1, U. S. A.

TORQUE CONVERTER

Symbol of greater output, longer life.

SELF-MOVING McCarthy

COAL RECOVERY DRILL

Using Augers 24 Ft. Long

Mining Low-Cost Quality Coal

These machines are built in a complete line of sizes using augers of 24, 30, 36, 42 and 48-inch diameter by 24 ft. long.

The modern **McCarthy Drill** is the unit you need for efficient operation in today's competitive coal market . . . it cuts coal mining costs.

The Salem Tool Company also produces coal recovery drills using 6-ft. and 12-ft. long augers in diameters of 16 to 48 inches to suit your needs. Write **The Salem Tool Company** for complete information.

Only 34 feet long and 12 feet wide . . . will operate in narrow pits.

All-around clear vision for operator . . . unobstructed view of highwall.

Heavy-Rugged-Powerful

(Located in Northern West Virginia)

THE SALEM TOOL COMPANY

779 SOUTH ELLSWORTH AVENUE • SALEM, OHIO, U. S. A.

MARCH, 1954

VOLUME 40 • NUMBER 3

Mining CONGRESS JOURNAL

CONTENTS

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Indexed regularly by Engineering Index, Inc.

THE AMERICAN MINING CONGRESS
RING BLDG., WASHINGTON 6, D. C.

3 Seconds Hammering... 20,000 Pounds Pressure!

O-B Wedge-Type Rail Bonds Give You:

- Metal to metal contact for lowest installed resistance.
- 20,000 pounds expansion pressure for permanent joint bonding and cross bonding.
- Ease of reclaiming for repeated use.
- 75% savings in bonding time, when track is relaid.

For the lowest installed resistance in arc-welded rail bonds, see your O-B representative about the AW-22 Bond. Its angular shaped terminal, shown at right, offers you the fastest, easiest welding possible.

4498-M

Ohio Brass

MANSFIELD OHIO, U. S. A.

IN CANADA: CANADIAN OHIO BRASS CO., LTD., NIAGARA FALLS, ONT.

Feeder and Trolley Materials • Control Materials • Trolley Shoes
Roof Bolt Shells and Plugs • Rail Bonds • Automatic Couplers

WHY WASTE TIME CHANGING STEELS WHEN YOU CHANGE BIT TYPES?

Dozens of different Timken® multi-use and carbide insert bits fit the same drill steel!

DO your men have to waste time going after a different set of drill steels every time a different type bit is needed? If so, you can save valuable drilling time by using Timken® interchangeable rock bits. Because dozens of different Timken multi-use and carbide insert bits fit the *same* drill steel, you can change bit types in less than one minute. That's all it takes to unscrew one Timken rock bit and screw on a different type.

You reduce costs further because you can cut your drill steel inventory. And your drillers can always switch to the most economical bit as the ground changes—right on the job!

Both Timken multi-use and carbide insert bits are made from electric furnace Timken fine alloy steel, have special shoulder unions that keep drilling impact from damaging threads.

Our rock bit engineers will be glad to run a test in your mine to determine the rock bits best suited to solve your particular drilling problems. There's no obligation. Write The Timken Roller Bearing Company, Rock Bit Division, Canton 6, Ohio. Cable address: "TIMROSCO".

WHERE YOU CUT COSTS WITH TIMKEN MULTI-USE BITS

Most economical for rock of average hardness. With correct and controlled reconditioning, they give lowest cost per foot of hole when full increments of steel can be drilled.

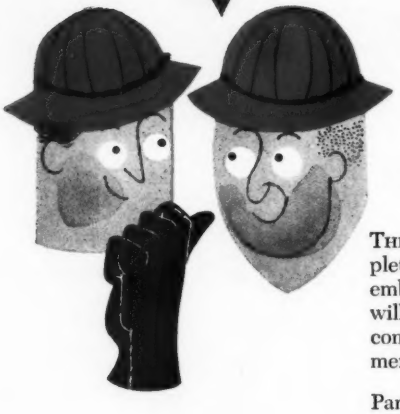
WHERE YOU CUT COSTS WITH TIMKEN CARBIDE INSERT BITS

Give highest speed through hardest, abrasive rock. Also most economical for constant-gage holes, small diameter holes, very deep holes.

TIMKEN

TRADE-MARK REG. U. S. PAT. OFF.

... your best bet for the best bit ... for every job

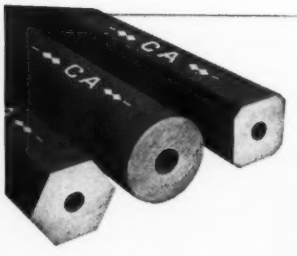


they're using CRUCIBLE HOLLOW DRILL RODS at FOLSOM DAM

THE FOLSOM DAM project is a big construction job. When completed it will be 340 feet high, 1400 feet long – with wing embankments extending for more than two miles. The new dam will provide a source for irrigation and power, and serve to control flood conditions in the American River Basin near Sacramento, California.

Part of the construction work involves the excavation of more than 9 million cubic yards of earth and rock. Here's where Crucible Hollow Drill Rods are playing a mighty important role. They can't be beat when it comes to hard rock drilling operations.

Crucible Hollow Drill Rods are made to tool steel standards by the world's largest producer of tool and other special purpose steels. This *extra* quality assures you of minimum rod breakage ... and fewer valuable bit losses. For dependability in rock drilling, buy Crucible Hollow Drill Rods.



CRUCIBLE first name in special purpose steels

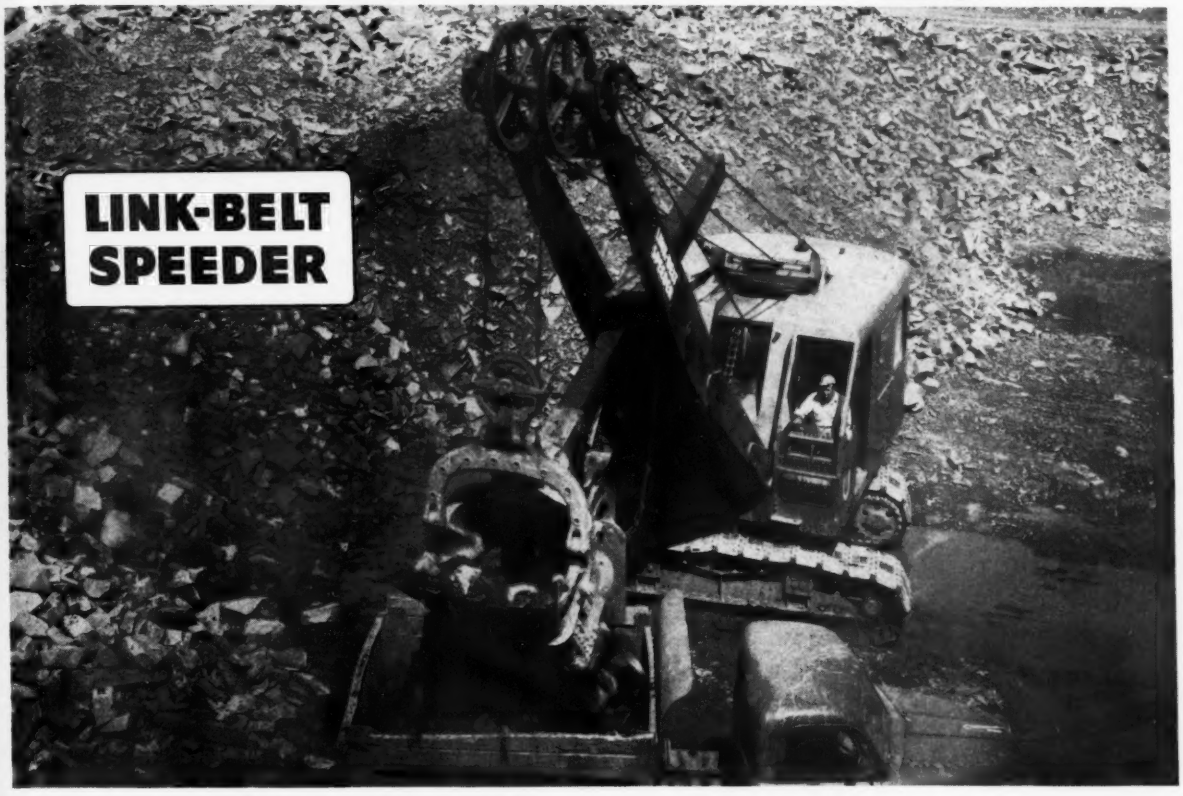
54 years of Fine steelmaking

HOLLOW DRILL ROD

CRUCIBLE STEEL COMPANY OF AMERICA, GENERAL SALES OFFICES, OLIVER BUILDING, PITTSBURGH, PA.

REX HIGH SPEED • TOOL • REZISTAL STAINLESS • ALLOY • MACHINERY • SPECIAL PURPOSE STEELS

Consider net hp--Consider live wt!



The design of a K-360's crawlers is another important feature. Perfect guiding, self-cleaning, smooth traveling crawler tracks . . . improve operation and minimize wear.

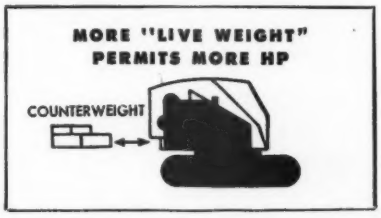
Figure a job with a Speed-o-Matic controlled K-360 ...and your bid will be a tough one to beat!

LIKE all Link-Belt Speeders, a 1½-yd. K-360's 142 net hp gives you more digging power . . . more lifting power than any rig in its class. This quality-built rig has the stamina (see box) to handle the extra net hp week after week . . . month after month . . . without undue wear.

Consider these facts along with the 25% greater output you get with Speed-o-Matic controls, the *true power hydraulic system:* (1) Faster, easier, more accurate operation, (2) minimized operator fatigue or end-of-the-shift letdown, and (3) exceptionally low maintenance and service costs.

These are a few of the reasons why a K-360 helps you get more jobs without shaving profit. Get the complete story. Ask your distributor or write for catalog 2259.

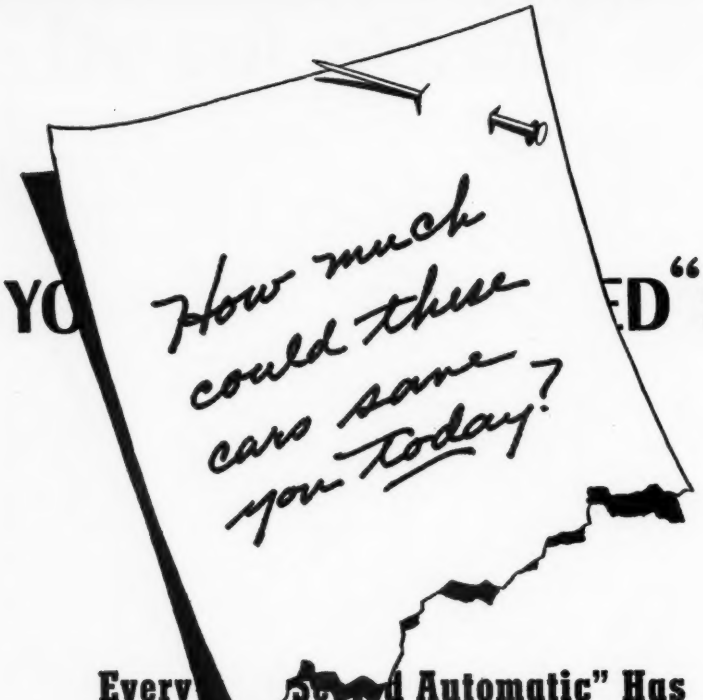
LINK-BELT SPEEDER CORPORATION
Cedar Rapids, Iowa 13,426



COMPARE 1½-yd. shovel-cranes with and without counterweight. That test spotlights the size, weight and heft built into the working parts and structure. You'll find the K-360 has greater "live weight."

BUILDERS OF A COMPLETE LINE OF CRAWLER, TRUCK AND WHEEL-MOUNTED SHOVEL-CRANES

LINK-BELT SPEEDER



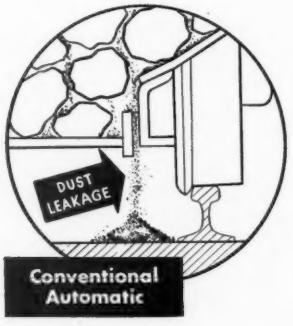
YO ED "S-D SEALED AUTOMATICS"

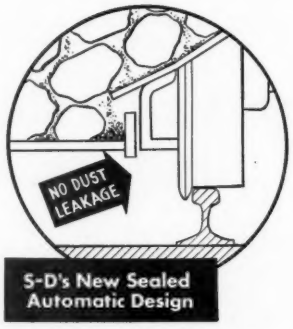
Every ...d Automatic" Has The Exclusive DUST-ROOF SEAL . . .

One of the disturbing costs in coal production today is track clean-up. In many mines it amounts to thousands of dollars over a period of a few years. It is money you can save.

For some time now, we have been supplying S-D Automatic Bottom Dumping cars to the mining industry that are completely sealed against dust leakage. In addition, these cars (1) will give you from ¼ to ½ ton extra capacity for any overall dimension and (2) they are equipped with S-D's *"Twin Safety Latches"* . . . two latches for safe and sure latching that are tripped independently underneath the car for automatic dumping.

Old, obsolete cars cannot cope with the low cost operation demanded in coal production today. They cannot remotely compare with the efficiency of our modern cars. Before buying mine cars, you should investigate these S-D Sealed Automatics, which have both the "Twin Safety Latches" and extra capacity.



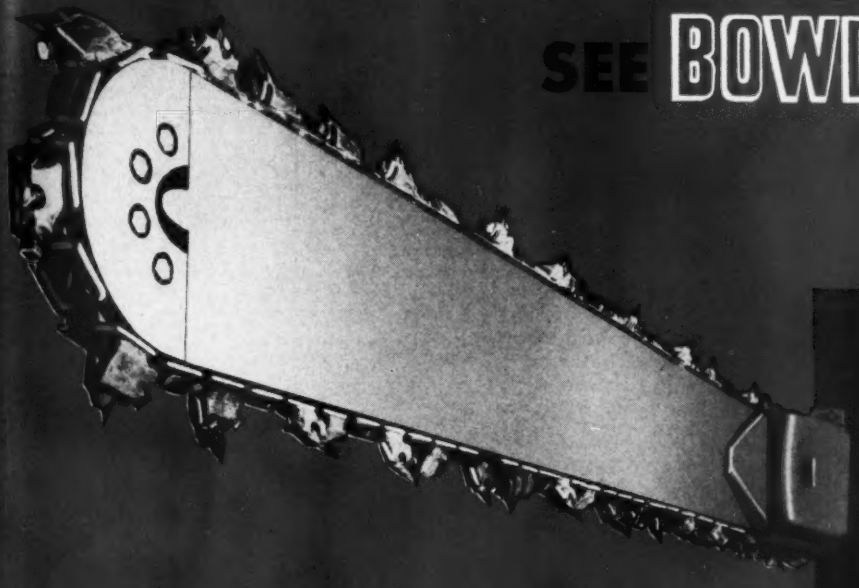


THE DUST STAYS IN THE CAR
The above detail drawings show how you can keep dust off your tracks with the S-D "Sealed Automatic." In the circle at top is shown the conventional drop bottom construction and how dust shakes down and out through the necessary clearance space between the door and the car frame. The lower circle shows how our new Dust-Roof Seal carries sifting dust across the open space, providing a 100% effective dust seal.

Sanford-Day Iron Works
KNOXVILLE TENNESSEE

coal cutting costs make you see Red ?

SEE BOWDIL* . . .



▲ West Kentucky Coal Company, Madisonville, Kentucky, cuts costs in their East Diamond Mine with this mobile cutting machine using Bowdil 9-ft. Cutter Bar, Bowdil Chain and new 1-29 Bowdil Bits.

PHOTO BY WM. VANDIVERT FOR WEST KENTUCKY COAL COMPANY IN COOPERATION WITH BITUMINOUS COAL INSTITUTE.

The BOWDIL Company

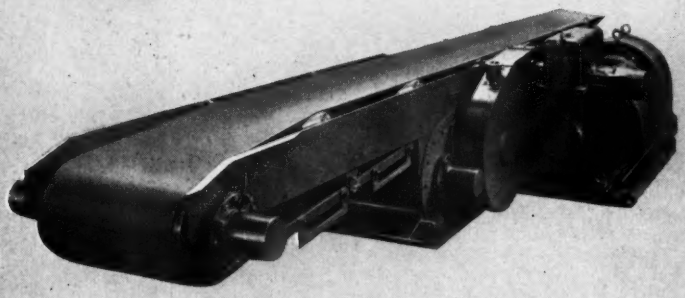
CANTON, OHIO

* ORIGINATORS OF THROW-AWAY BITS; MANUFACTURERS OF BARS, BITS, CHAINS AND OTHER PRODUCTS FOR COAL MINING; CUSTOM MACHINERY DESIGNERS AND BUILDERS; HEAT-TREAT SPECIALISTS; SALES AGENTS FOR THE CINCINNATI ELECTRIC DRILL.

JEFFREY

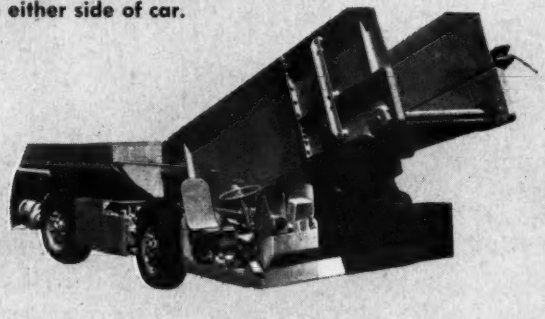
CONVEYORS

Jeffrey Belt Conveyors are used for intermediate and main haulage. They handle large tonnages rapidly and provide low-cost maintenance. These Sectional Conveyors are available in three belt widths — 30, 36 and 42 inches. Also chain conveyors in various types and sizes for face and room work.

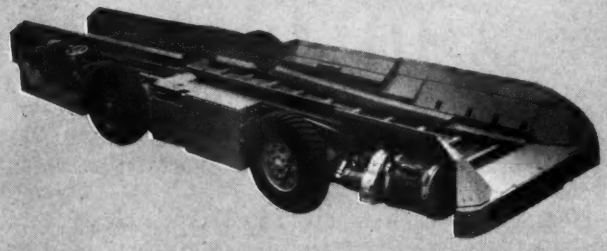


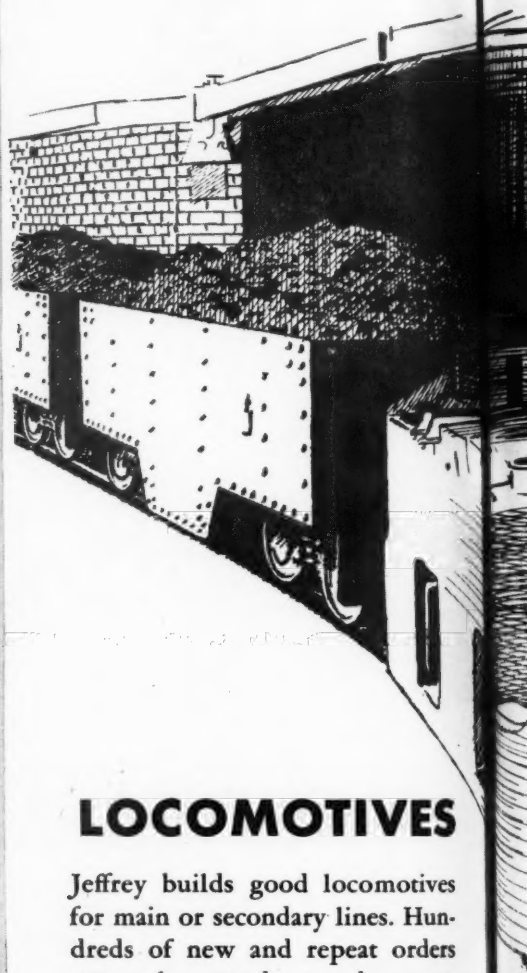
SHUTTLE CARS

Another means of getting coal out quickly and economically. Jeffrey Shuttle Cars are ideal media between the face and main line haulage . . . are a big factor in cutting production costs. Various models with heights to suit conditions. All furnished with four-wheel drive and steering, with operator's platform on either side of car.



Above — Jeffrey 66-C4 Shuttle Car 48" high. Shows discharge end raised for elevating coal into mine cars. Accomplished by hydraulic raising and lowering device. Photo taken from operator's side of car. *Below* — Jeffrey 66-A4 Shuttle Car. It is 30" high with 6" sideboards. Also shows the operator's control pit. You'll like these new Jeffrey Shuttle Cars. They serve a definite purpose in the mine.

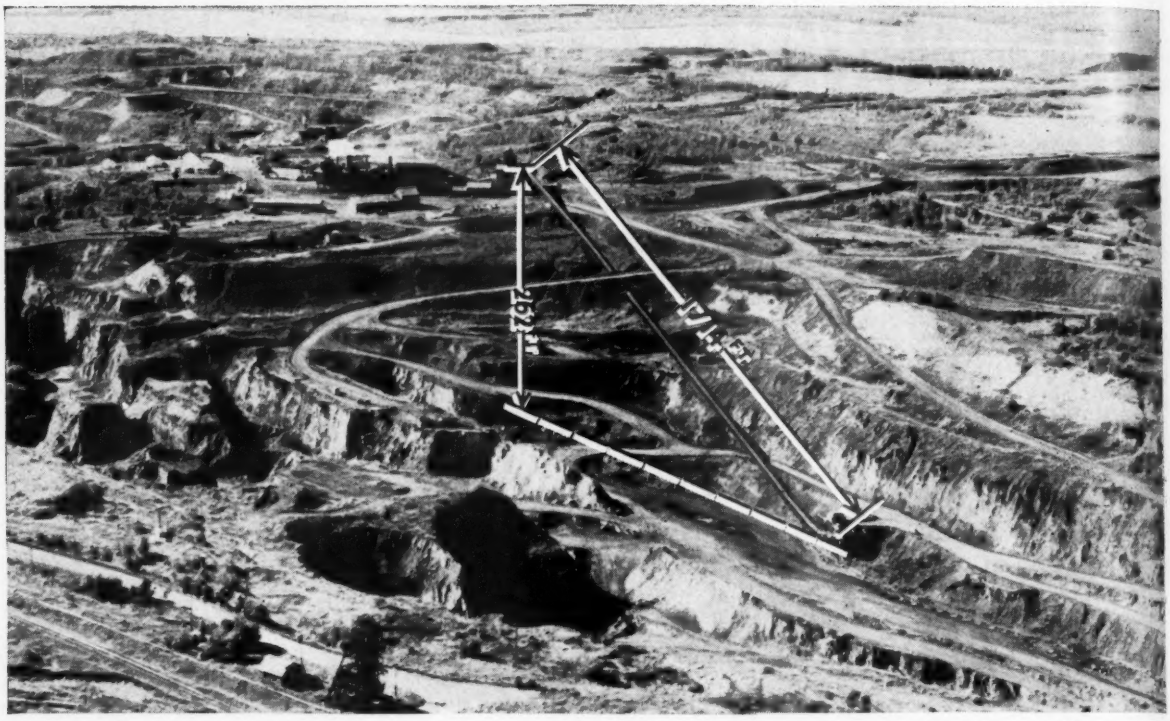




LOCOMOTIVES

Jeffrey builds good locomotives for main or secondary lines. Hundreds of new and repeat orders prove they stand up under severest haulage duty, giving reliable performance year after year. Single or tandem units, four or eight wheel, trolley or storage battery — all are backed by Jeffrey's engineering ingenuity. Call on Jeffrey for the best in modern, economical mine transportation.

Planning an ore handling project?



Straight as an arrow, Link-Belt roller bearing belt conveyor rises from iron ore pit floor to concentrating plant. Almost one-third of a mile long, its uninterrupted delivery of high tonnages permits far lower handling costs than other forms of transportation.

LINK-BELT accepts complete responsibility for design, equipment, erection and performance

As mineral deposits grow leaner, larger and larger tonnages must be handled to recover concentrates in quantities to meet ever-increasing demands. At the same time, the processing of many ores has become more complex. These are two good reasons why it pays to call in Link-Belt if you're planning an ore handling project.

For Link-Belt will accept complete responsibility for the design, erection and furnishing of systems for handling ore and overburden—plus responsibility for satisfactory performance.

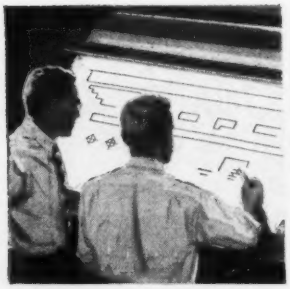
An installation—typical of many on which Link-Belt has performed this overall function—might move huge tonnages from the mine . . . process, store and reclaim the material . . . finally carry it to rail or dockside and load it out.

Get the facts on how this single *proved* source can integrate every factor of any contemplated project, large or small. A call to the Link-Belt office near you will place Link-Belt's broad engineering facilities at your disposal.

LINK-BELT

PROCESSING AND HANDLING EQUIPMENT 19,398

LINK-BELT COMPANY: Executive Offices, 307 N. Michigan Ave., Chicago 1. To Serve Industry There Are Link-Belt Plants and Sales Offices in All Principal Cities. Export Office, New York 7; Canada, Scarboro (Toronto 13); Australia, Marrickville, N.S.W.; South Africa, Springs. Representatives Throughout the World.

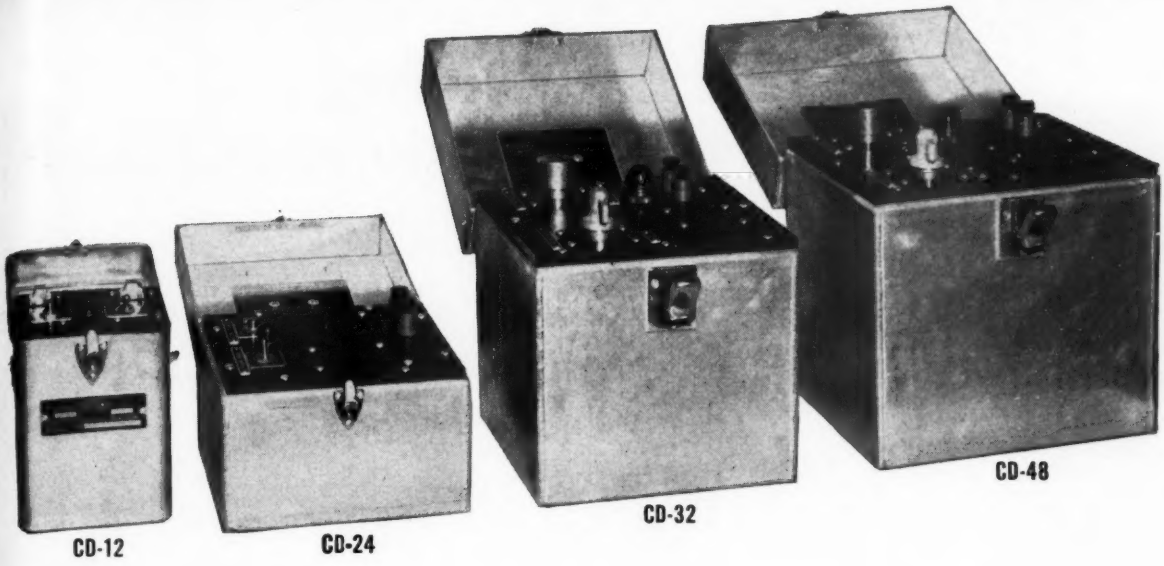


OVERALL ENGINEERING. Experienced design and field engineering staffs integrate all factors, assure expert planning.

DEPENDABLE EQUIPMENT. From Link-Belt's broad line, you get equipment that will stand up under the toughest jobs.

COMPLETE ERECTION. Experienced Link-Belt superintendents, staffs and skilled crews carry through on every detail.

SATISFACTORY PERFORMANCE. When you rely on Link-Belt as a source, we accept responsibility for successful operation.



For more powerful, more dependable, safer electric blasting, use Du Pont CD Blasting Machines

You can fire any conceivable type of blast . . . large or small . . . on the surface or underground . . . with maximum safety, efficiency and economy with Du Pont CD (Condenser Discharge) Blasting Machines—newest development of Du Pont Explosives Research.

Du Pont CD Blasting Machines offer a simple and satisfactory method of firing either primary or secondary blasts. These four lightweight, portable power sources have capacities ranging from 20 holes in straight series to 1200 holes in parallel series. Safety is greatly increased with Condenser Discharge Machines because power *cannot* reach blasting circuits except by the deliberate action of the operator.

These machines eliminate maintenance of permanent firing lines and dependence on motor generators. They have no moving parts, require no physical effort as with mechanical-type machines, and are extremely easy to operate. Long-lasting radio-type B batteries charge the condensers, light up a pilot lamp when they're fully charged. Shots are fired only by turning on a firing switch. Terminals are dead until the instant of firing.

It's easy to fire large or small shots with maximum safety using Du Pont CD Blasting Machines. Ask the Du Pont Explosives representative in your area for complete information about them. E. I. du Pont de Nemours & Co. (Inc.), Explosives Dept., Wilmington 98, Delaware.

Characteristics of Condenser Discharge Blasting Machines

Model	Rated Voltage	Capacity with Leading Lines Not Exceeding 3.0 Ohms Resistance			
		Straight Series		Straight Parallel	Parallel Series
		Primary	Secondary		
CD-12 Weight 4 lb Width 4 in Length 5¼ in Height 7 in	120	20	30	NR*	NR*
CD-24 Weight 12 lb Width 7¾ in Length 8¼ in Height 6½ in	240	50	75	NR*	240 (6 series of 40 each) (8 series of 30 each)
CD-32 Weight 22 lb Width 9½ in Length 9½ in Height 10½ in	320	50	125	30	480 (10 series of 48 each) (12 series of 40 each)
CD-48 Weight 27 lb Width 9½ in Length 11 in Height 12¼ in	480	50	200	60	1,200 (24 series of 50 each) (30 series of 40 each)

*NR means not recommended for the purpose.

DU PONT EXPLOSIVES

Blasting Supplies and Accessories

DU PONT

REG. U.S. PAT. OFF.

BETTER THINGS FOR BETTER LIVING . . . *THROUGH CHEMISTRY*

announcing . . .

THE NEW BUCYRUS-ERIE

480-W

12 cu. yd. WALKING DRAGLINE

WARD LEONARD ELECTRIC or DIESEL

The new 480-W incorporates advanced design features that have been field-proved through years of service in other Bucyrus-Erie walking draglines. It is a big-yardage, all-weather machine, built for year-after-year profitable operation.

LONG WORKING RANGE — Moves material 431 ft. with 215-ft. boom and 8-yd. bucket without throwing bucket; 395 ft. with 195-ft. boom and 10-yd. bucket; and 359 ft. with 175-ft. boom and 12-yd. bucket. Digging depths range up to 141 ft.

EASILY MANEUVERED into best working position with exclusive Bucyrus-Erie walking mechanism.

ALL-WEATHER WORKER — Bearing area is large to permit working on soft ground. Weight and loads are balanced so center of gravity shifts through limited range, keeping base rim pressures low.

MAIN MACHINERY IS SIMPLE, and is firmly held in alignment on strong frame. Minimum of moving parts means low maintenance.

ALL-WELDED, TUBULAR-BRACED BOOM provides plenty of strength without excess weight.

BIG OUTPUT results from dependable, year-round performance, fast moves, and rapid work cycle.

You are invited to send for additional information on how the 480-W can help you solve stripping or other long range excavating problems.

BUCYRUS ERIE

46L53C

BUCYRUS-ERIE COMPANY SOUTH MILWAUKEE, WISCONSIN

WHAT FULL CONTROL MEANS

to the operator of an Allis-Chalmers TR-200 Motor Wagon

Fast, Efficient Loading — hydraulic steering control gets the TR-200 under the shovel fast without tiring wheel fight. Large top area permits fast loading with less spillage . . . double steel floor is reinforced with heavy oak plank to absorb loading shocks. Steering jacks and tires are fully protected from falling rock. The TR-200 carries 15 cu. yd. heaped or 18-ton loads.

Quick, Clean Dumping — operator controls two hydraulic jacks to dump and return bowl. Because this unit's wheelbase remains stationary, all four brakes can be set for maximum safety in bank-edge dumping. Rear end dumps far enough over embankment to eliminate rehandling material. Tapered bowl design and 70-degree tilt give quick, complete load ejection. Body may be heated to prevent load freezing.

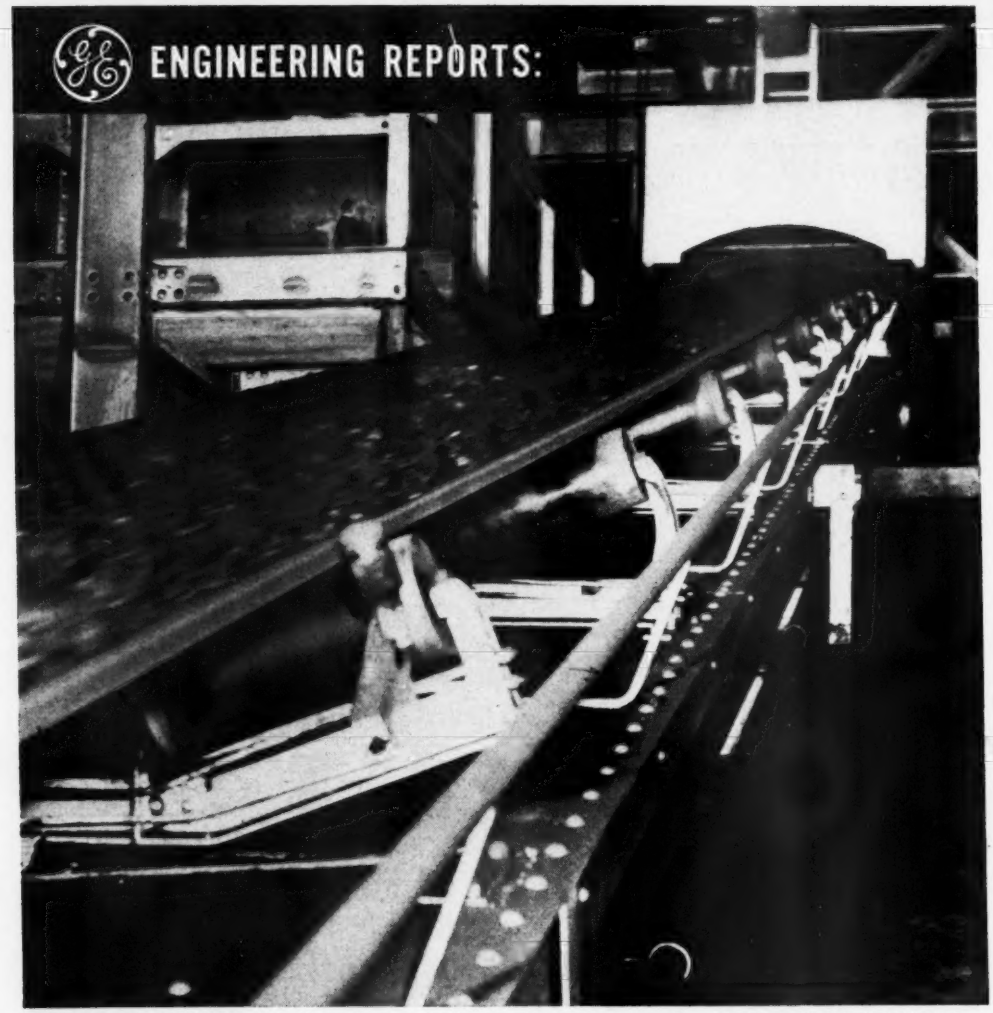
Safe, High-Production Hauling — no worry when highballing a full load because four-wheel air brakes stop the TR-200 quickly even if the engine should stall. Steering pistons are equipped with stops to eliminate jackknifing. High horsepower-to-yardage ratio and large, rock-lug tires speed your operations . . . even on steep grades and in heavy going. The TR-200 travels at speeds up to 21.6 mph., delivers more loads, reduces idle shovel time.

Plus Added Versatility — The same 176-hp. diesel tractor unit and hydraulic controls may be used to operate an interchangeable self-loading scraper body for large scale stripping and hauling jobs.

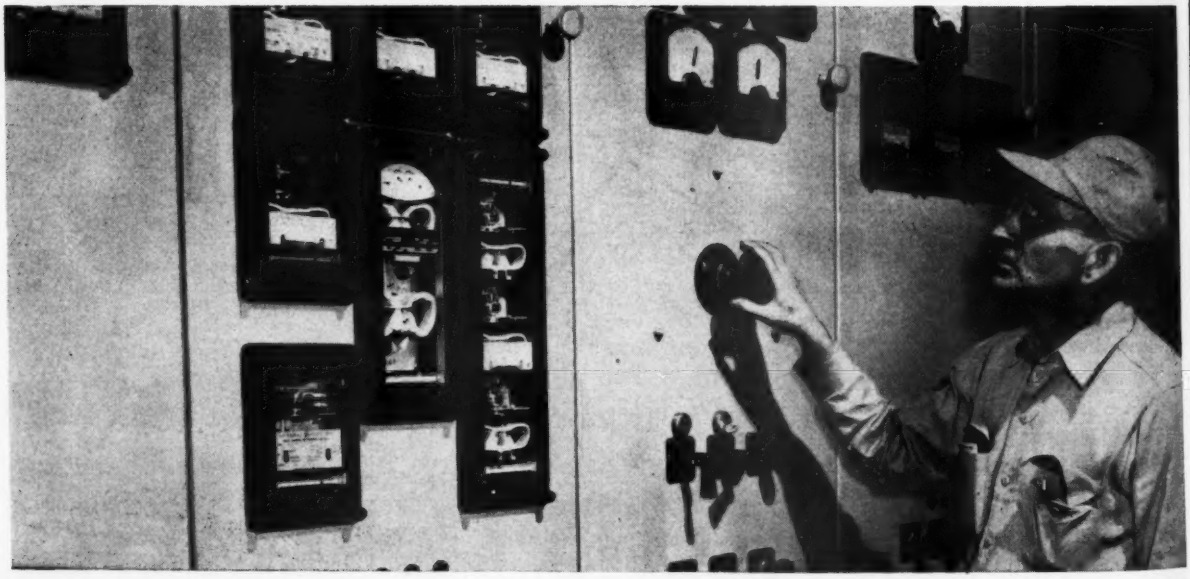
GET THE FULL STORY FROM YOUR ALLIS-CHALMERS DEALER

ALLIS-CHALMERS
TRACTOR DIVISION • MILWAUKEE 1, WIS.

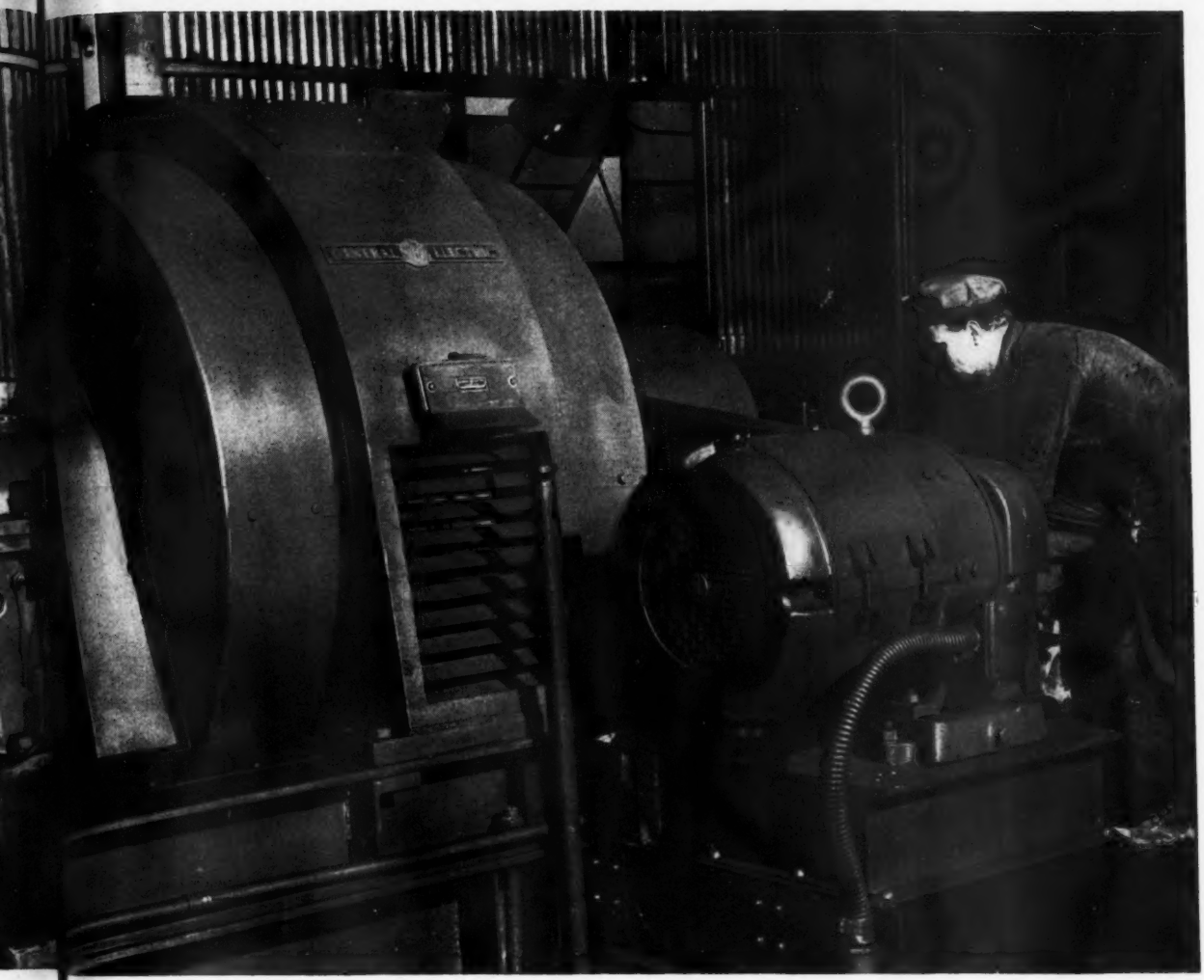
ENGINEERING REPORTS:



HIGHEST-LIFT CONVEYOR hauls coal up a 16-degree slope to preparation plant at C. W. & F.'s Orient No. 3 Mine. A G-E drive moves the 42-in. wide belt 625 feet per minute, handles 1200 tons per hour.



CENTRALIZED CONTROL—middle cabinet controls conveyor motor; cabinet at right controls motor when driven as generator.



EASY-TO-MAINTAIN 1500-hp synchronous motor powers belt—may also be used as diesel-driven generator for stand-by power.

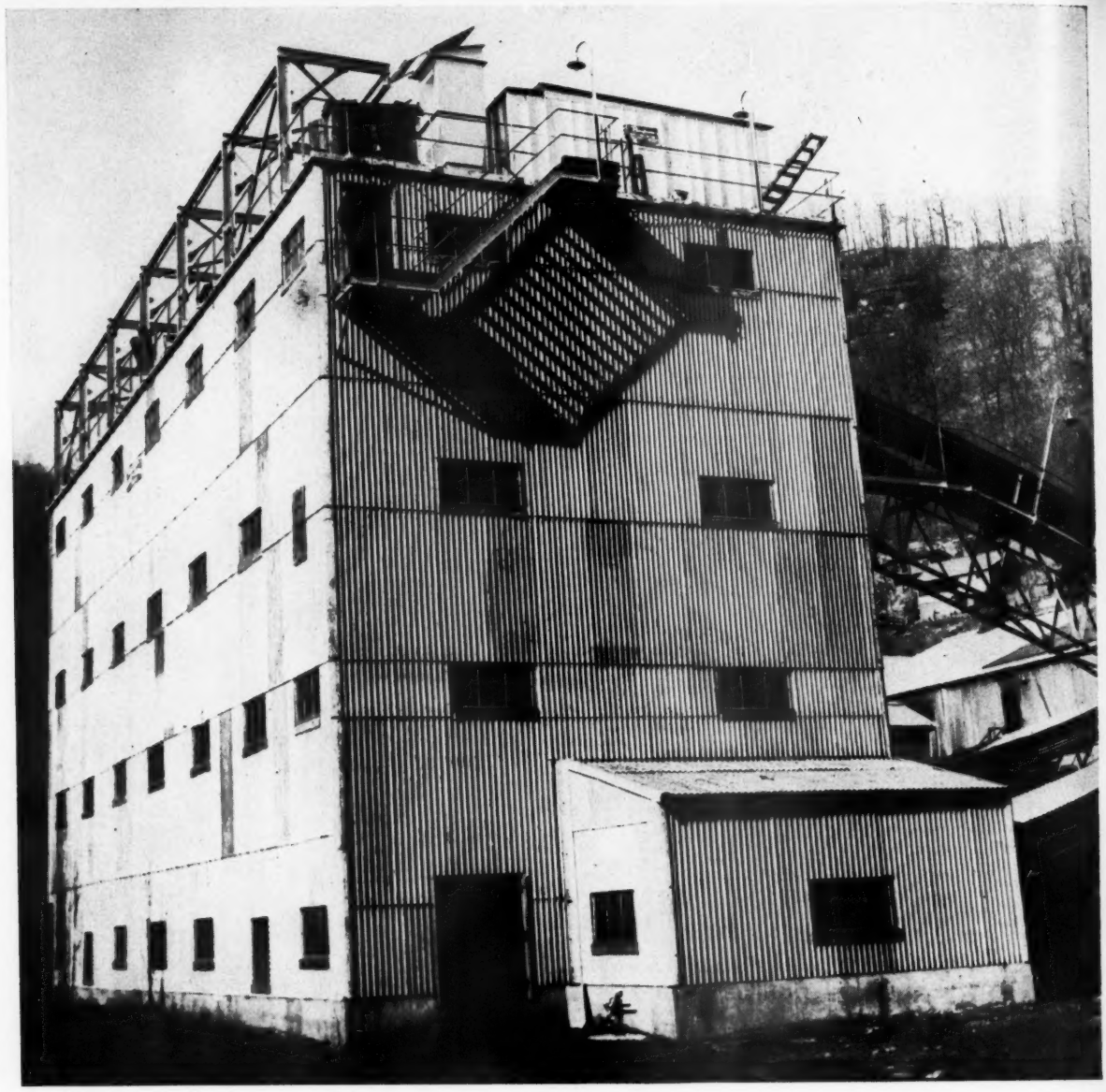
Record conveyor powered by G-E drive

WORLD'S HIGHEST-LIFT SINGLE-BELT CONVEYOR is located at the Chicago, Wilmington & Franklin Coal Company's Orient No. 3 Mine in Illinois. This Link-Belt conveyor carries coal up a 16-degree slope—lifts 868 feet in one 3290-ft continuous flight. The 42-in. wide belt operates at 625 ft per min, handles 1200 tons per hour. A General Electric drive was chosen for this conveyor because: first, the reliability of the motor and control permits regulated starting and selected speed operation. Second, the synchronous motor has important power factor correction ability, and third, G-E system engineers helped co-ordinate the drive for easy starting, minimum maintenance, greater safety.

Another factor in the selection of a G-E drive for this unusual conveyor was G.E.'s many years of experience powering more conventional conveyors. This experience is at your service. Your nearby G-E Apparatus Sales Representative can tell you more. General Electric Company, Schenectady 5, N. Y.

Engineered Electrical Systems for Coal Mines

GENERAL ELECTRIC



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Editorials

JOHN C. FOX, *Editor*

MARCH, 1954

The Ides of March

MARCH, 1954, A. D., promises to be as fateful for the domestic mining industry as March, 44, B. C., was for Gaius Julius Caesar. Let's hope it won't be as fatal.

One well-known legend has it that a soothsayer or "augur" warned "the noblest Roman of them all," on his way to appear before the Senate, to "Beware the Ides of March." Assuming the role of modern "augur" we bid the mineral industry watch carefully the portentous events taking place in the Halls of Congress during this month.

The Commission on Foreign Economic Policy (the Randall Commission) was scheduled to make its report on March 6. Actually, it did so six weeks earlier but the full impact of the report will be felt in the discussions that take place this month.

Early last August the Senate Finance Committee and the House Committee on Ways and Means asked the United States Tariff Commission to make an investigation of the lead and zinc industries and to set forth the facts relevant to production, trade, consumption and importation into the United States of these commodities. The Commission was directed to submit the results of its investigation on or before March 31.

In October President Eisenhower appointed a cabinet committee to look into "the establishment of a national policy relating to the production and utilization of metals and minerals." He asked this committee to report to him and his Cabinet well before the date set for the Tariff Commission's report to Congress. Dr. Hauge, White House assistant on economic matters, has also been asked to report on the lead-zinc industry's plight.

Any consideration of mineral policy must, of course, give special attention to critical problems of the coal industry, including continued damage from excessive imports of low cost residual fuel oil.

As this month opened, the House Labor Committee was considering Taft-Hartley amendments in closed-door sessions. The Senate Labor Committee is also deliberating on this subject. What comes out of these sessions can have far-reaching effects on the mining industry.

The Internal Revenue Code is coming up for an over-all overhaul and there is action on the percentage depletion front.

Open hearings on Gold and Monetary Policy will be held to consider restoration of the Gold Standard and full convertibility at a realistic price for the metal. What Congress decides as a result of these hearings will affect not just mining, but our entire economic structure.

Caesar's appearance before the Roman Senate was brief and its conclusion abrupt. He was surprised to find that friends outnumbered enemies among his assailants. Through ignorance or misunderstanding, because Caesar kept his own counsel, they took decisive action against him.

Through its spokesman, our industry has made known to the modern Solons where it stands on each of the issues up for congressional action this month. In our Republic the individual may speak as loudly as the political giant. Indeed David often commands more attention than Goliath. Each voice added to the chorus will help dispel any remaining doubts as to the industry's position. Don't, for lack of trying, let the mining industry go down gasping, "Et Tu Brute!"

In an article beginning on the next page, the authors point out that the long range future of metal mining is bright. Likewise, with every step of scientific discovery and with every increase in population, coal's role in the national economy becomes bigger and more vital. The nonmetallics too, are destined for greater use in keeping with the times.

But to reach that bright future we must surmount the present-day obstacles that block our way. We repeat, March, 1954, will be a fateful month for the mining industry.

More people use more steel every year

Research—Foundation For Mineral Progress

Horizons for Minerals Are Bright and Research Is Working to Make Them Even Brighter

By CLYDE WILLIAMS
and
DAVID C. MINTON, Jr.
Battelle Memorial Institute

WHEN we look back over past history, we find that there are only three really basic factors that influence long-range trends in minerals in this country. Two are continually at work to enforce increased mineral production and usage. They are:

(1) A constantly increasing population.

(2) A constantly increasing standard of living.

The third factor is technology. This factor also tends to increase total mineral production, but it does not treat all metals or all minerals equally. Technology may throw great gains to some metals while acting to suppress others. Technology is the variable that determines what metals or minerals will prosper most in the rising tide of production and demand.

As can be demonstrated, technology is much more important to the future of any mineral than temporary market or price situations. It is also more important in its long-range effects than wars or economic recession.

Let's look back several decades to see how our economy has been going and how metals and minerals have fared in it.

Curves (Fig. 1) representing population growth in the U. S. and the growth of production in terms of a uniform dollar, show that, although wars, business recessions, and depression have caused many ups and downs in producton, the trend has been ever upward. Averaging out the high and low points in the production curve, the trend can be represented as a smooth curve (Fig. 2).

The result is one of the most significant presentations of the effectiveness of the American industrial system that one could devise. Here we see how production has increased much more rapidly than population, thereby sharply increasing the standards of living of the American people. Note, particularly, the change in the slope of the production curve between 1935 and 1940. This period represents the start of what has come to be known as the Technological Revolution. About this time our industry changed from one based primarily upon the exploitation of rich natural resources to one based upon the exploitation of knowledge gained through research. The result, implemented by the war, of course, has been a tremendous upsurge in production, with the curve for gross national product leaving the population curve rapidly.

These two curves, then, illustrate that there are two basic factors continually at work to enforce increased mineral production and consumption in this country. We have a constantly increasing population, and a constantly increasing standard of living. You can't supply more and more people with more and more goods without using more and more raw materials, including metals.

Metal Use Grows

Now, let's look at simplified or flattened-out trend curves (Fig. 3) for metal consumption in this country. Demand for copper, lead, zinc, and tin has increased with time. The trend curves for these metals are imposed on the graph showing gross national product and population.

Copper, lead and zinc have enjoyed an increasing demand, parelleling somewhat the growth curve for the gross national product. The slopes of their curves since 1940, however, have not been as steep as the slope for total production. This, no doubt, reflects the inroads made by the light metals and by plastics, glass, and ceramics, in filling materials demand. Thus, while

these three metals are showing excellent growth trends, they are being deflected from their maximum potential because of technological competition. As pointed out above, technology is the variable that determines how well the individual metal fares in gross production.

Show Effect of Research

While there has been a slight upward movement to the trend curve for tin, it seems to have flattened out about 1940 at a level not much higher than in 1920. Tin is definitely not sharing in the growth pattern experienced by the other nonferrous metals. This, of course, arises from the fact that our industries cannot be assured of an adequate supply of tin at prices comparable with those of substitute materials. Most of the research on tin use in recent years has been along the lines of conservation and substitution and has had the effect of reducing per capita consumption. The effectiveness of this research is demonstrated by the flattening of the tin demand curve.

When the trends curves (Fig. 4) for the production of aluminum and magnesium are compared against the curves for gross national product and population, we see the factor of technology exerting dramatic influence. At about 1935, the curve for aluminum began a steep ascent, rising almost vertically during the war period. Magnesium, about 1940, began its rise. Since most of the action on the trend curves for these metals has been in recent years, making the exact slopes of their curves indecisive, actual production curves are also shown here by the dotted lines.

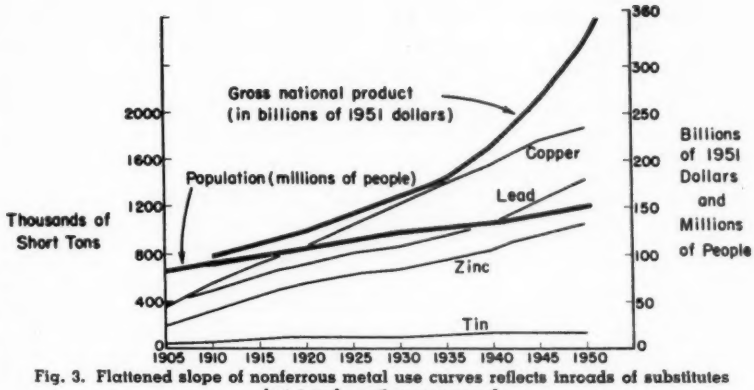


Fig. 3. Flattened slope of nonferrous metal use curves reflects inroads of substitutes but trend continues upward

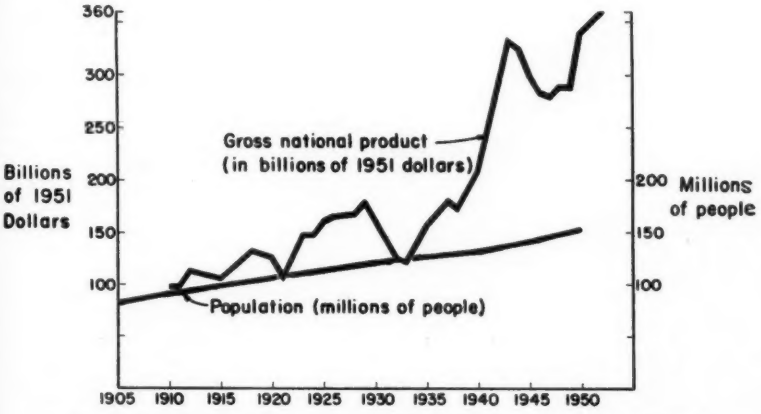


Fig. 1. Regardless of setbacks production and population climb upward

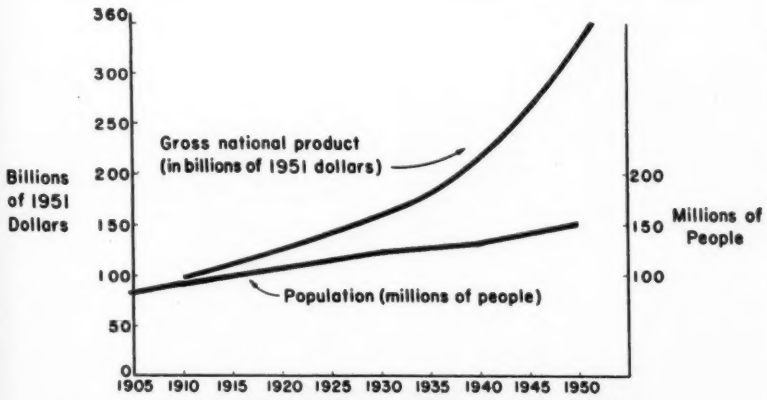


Fig. 2. The Technological Revolution came about 1935

Room for Expansion

Although steel, as the basic metal of our economy, is highly receptive to every economic wind when the high and low spots are averaged out, the trend (Fig. 5) is definitely upward at about the same space as gross national product and at a rate much faster than population growth. In other words, more people are using more steel every year, and indications are that this trend will continue.

Thus, as these curves have shown, the long-range prospects are good for all the domestically produced metals considered. If one plotted trend curves for the other metals, similar upward turns, some very dramatic, would be indicated. One is led to the inevitable conclusion that the long-range prospects for metals production in this country are very bright.

This does not mean, however, that individual metals will have *easy* going. On the contrary, the competition will be rougher than ever before in history, because we are in a period characterized by technologically induced extremes. Technology stands as a sword, ready to cut down the growth potentials of those metals not embracing it, or to thrust to new heights the growth curves of those metals that grasp and use it.

Of one thing we may be certain: Nothing short of an unprecedented national catastrophe will stop the growth trend of our total national product. We may have business peaks and business lows, but when these are averaged out total production will march continually upward. Population increase will assure part of this production growth, but the demands of the American people for more and better things will account for most of it. And, with production going constantly upward, there will be room for expansion of all our mineral industries. Even though plastics, glass, ceramics, and unheard-of synthetics should come in for greater shares of markets, there will still be opportunity for all of the older metals to maintain good growth rates.

Technology Creates Markets

What will be the technical bases for increasing growth of our total national product? There are limits to the numbers of refrigerators, automobiles, et cetera, that the American people may want. To have a continually increasing demand for products, there must be new wants created through technology. What technical developments are around the corner that will increase the consumption of metals and other materials?

Developing at this very moment in our laboratories are things that presage great future industrial activity. These include new and improved comforts for the home, new developments in transportation, new methods of production, and new mechanisms for national defense.

We may reasonably expect to see the American home electrified in the future to a degree unimagined a few years ago. Air conditioning already is passing from the luxury stage, electric laundries and television are commonplace, refrigeration is now regarded as a necessity, and electrical heating has distinct future possibilities, particularly when electricity is used in connection with heat pumps or solar-energy storage systems. Electricity will be used more and more for cooking, the freezing of foods, hot-water heating, and for the operation of small motors to relieve the housewife of monotonous chores in the kitchen. Color television looms as a certainty. On the farm, electricity will be harnessed to more and more jobs. All of this increase in electrical use, together with obsolescence of equipment and appliances now in use, will mean greater demands for metals. Metals will be needed for the fabrication of electrical-consuming products and for the building of power-generating plants and transmission lines.

The home, also, as present trends indicate, will require increasing amounts of metals for its construction. This will be true because of more exacting requirements in its functional features, the versatility of metals, and the demand for increased luxury. Standards of construction are rising, which draw upon metals increasingly.

Automatization Uses Metals

In the country's capital plant, even greater demands for materials loom. We see for instance the beginning of a change to automatic production and automatic business processing. The present state of development of servomechanisms and electronic data-processing machines is such that automatic factories, automatic office procedures, and automatic merchandising are inevitable. These will bring tremendous requirements for materials —copper, aluminum, lead, zinc, steel, titanium, tin, zirconium, magnesium, the alloying elements, and even rare metals. There will be like demands for chemicals and ceramics, as our capital plant gradually changes over to electronically controlled production. In the process of adapting production lines and business procedures to electronic control, a major replacement of capital equipment will be required. Then, once automatic industry becomes a general reality, the increased productivity that it brings will make even additional demands upon materials.

Transportation is a heavy consumer of metals, and transportation is highly dynamic. Jet planes, rockets, increased electrification of railroads, and belt conveyor lines will require prodigious quantities of the basic old metals and great quantities also of new metals, new alloys, new synthetic structural products. If atomic energy should be developed to its fullest expectation, it might bring fantastic demands for materials.

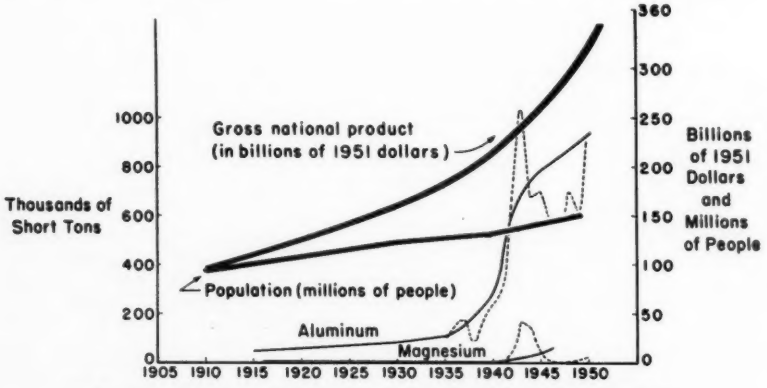


Fig. 4. Technology affected consumption of light metals dramatically

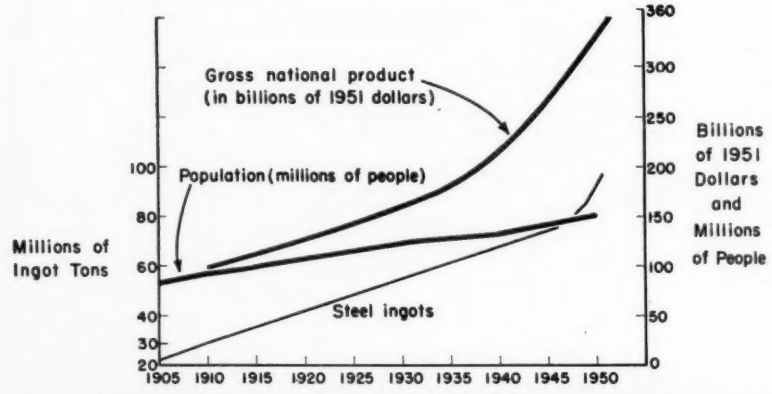


Fig. 5. Nothing short of an unprecedented national catastrophe can halt the upward march of living standards

Destiny of Light Metals

The light metals, aluminum, magnesium, and titanium have their futures fairly well plotted for them. Aluminum, because of its good conductivity and low density, will share heavily in future electrification. It will also find increasing use in heat-exchanger mechanisms, and as a structural material, both for stationary and mobile structures. Aluminum-coated steel is in the pilot-plant stage of development and is already being used for some commercial products. Aluminum, and even magnesium, will be used increasingly for die casting.

Magnesium has great possibilities as a structural material for aircraft, and it will find new uses in the manufacture of tools and equipment that must be lifted or carried. Titanium, because of its weight-strength ratio and corrosion resistance, has potentialities in transportation, in chemical processing, and even as decorative metal.

Nonferrous Needs Greater

The nonferrous metals, copper, lead, zinc, and tin, have so many diversified and old-established uses in which they serve so admirably that their consumption will continue to rise with the increase in population and improvement in scale of living. Special uses in dynamic industries will cause greater than normal demand. For example, the electric-power industry has been growing and doubtless will continue to grow at a rate that doubles

every ten years. This continuing growth will require vast quantities of the old nonferrous metals. The application of electronic data-processing and control machinery to business and industry will bring heavy demands for copper in conductors, zinc in protective applications and in mechanism parts, and lead and tin in solders. With machines in the future actually being used to replace the human brain and nervous system in production, copper may readily become the primary "nerve fiber" of industry. Peacetime application of atomic energy could conceivably skyrocket the demand for lead and copper, in particular. Electronic developments, with their requirements for metals of unusual electrical and photoelectric properties that are now produced as by-products of zinc, copper, and lead production, will strengthen the growth potentials of the old nonferrous mineral industries.

Steel Needs Will Grow

Steel, as the primary metal of our economy, will enjoy unabated demand. The long-range effects of its competition will probably be to increase steel demand rather than diminish it. When you develop a substitute for steel in some application, you create a demand for steel to build the plant and machinery to produce the substitute. Steel will find increasing use in combination with other metals, plastics, concrete, and ceramics to create new products and expand markets both for itself and its competitors. Portland cement is an example of a ceramic material that is finding new uses because of its combination with steel.

The horizons for the ferroalloys are self obvious. Higher operating temperatures in industrial processing and in jet engines and similar types of propulsion equipment bring demands for metals with exacting temperature, corrosion, stress, and fatigue properties. The need for alloy steels and the so-called "super alloys" will be great. The producers of nickel, chromium, cobalt, columbium, molybdenum, tungsten, vanadium, and manganese may be well put to meet future demand for these alloying elements.

New Metals and Alloys Rise

Just as aluminum and magnesium have arisen from obscurity to places of prominence in our economy—and just as titanium and zirconium are now winning their places—so will other metallic elements attain industrial utility. In recent years, germanium, once a useless by-product of zinc production, has become a material in great demand as semiconductor in the communications field. Antinomy, through recent research, may well find a place in this field with germanium. Indium, another zinc by-product metal, with potentialities as a bearing liner, solid lubricant, seal material, alloying element, and solder constituent, seems destined to become of industrial importance. Bismuth, once brittle and unworkable, can now be made into ductile wire and strip. Silicon still defies efforts to make it ductile but has real possibilities as corrosion-resistant protective coating. Lithium has good alloying properties, and magnesium-lithium alloys are particularly promising. These, and still others of the unusual metals will enter the industrial picture.

Research Will Decide Fate

Big variable in the future of all minerals will be technology. Over the long pull, research will be the deciding factor that determines what share of new business goes to the individual metal. If the thinking is limited with regard to one metal and efforts are bent on retaining old markets without exploiting new, the competitor will certainly gain ground. If, on the other hand, thinking is expensive and a constant program of research is carried on to find new markets, progress can be assured. Then, there is always the unexpected. No one knows today what research will uncover tomorrow that may exercise dramatic influence on metals demand.

Research will be highly competitive —necessitating that individual companies apply it with all the more vigor. As in the case of tin, research can be highly effective when directed to minimize metal consumption. Each metal, in its technology, must compete against other metals and against the nonmetallics. The older nonferrous metals, particularly, will have a battle to make their "use research" more effective than the "conservation research" of their markets.

Any fear on the part of industrial consumers of shortages of a particular metal will spur them to seek substitutes for that metal. It therefore behooves each metal to give attention to its supplies. No metal can prosper by a continuing overbalance of demand or by restriction of output; there are too many competitive materials ready to take its place.

Improve Discovery Methods

Research, then, should be directed toward increasing supplies of minerals as well as finding new uses for them. We need to develop new ways for locating underground deposits of ores. There is good reason to believe that there are rich deposits still untapped surpassing in magnitude those we have already tapped. Through research in geophysics and geochemistry, we should be able to develop means for finding these ores.

In the processing of minerals, there is room for increased efficiencies and increased production. Particularly needed are economical methods for winning widely dispersed elements. In recent years, great progress has been made in the utilization of lower grade metal-bearing rock, and we now see ways for making uneconomical deposits economical by winning from them a multiplicity of constituents in carefully integrated operations.

New developments in physics and chemistry offer possible ways to recover metals from diffuse sources. Right now we have a backlog of tech-

Industrial research seeks practical application

nical principles, which if applied to the minerals industries might extend our concepts of mineral reserves. The principle of ion exchange, for instance, may be the answer to the recovery of metals from leach solutions, waste waters, and even from the ocean.

Just how does research—the foundation for mineral progress—stack up in the present economy? Will its impact be as portentous as it now seems?

Research a Major Industry

A few years ago it was fashionable to say that research was becoming a big business. Now such an expression is not only trite, but inaccurate as well. Research *is* a big business—a major industry in its own. This year the total U. S. research bill, including research in the agricultural and biological sciences, will surpass the $3½ billion mark. About $2 billion of this is financed by the government and the balance by industry. We are now spending far more in one year on research than we spent in the entire decade from 1930 to 1940, when we thought we were well into the scientific age. If the present rate of research effort is merely maintained, research expenditures in the present decade will amount to more than 100 times our expenditures in the 1930's.

All of this research in one way or other affects mineral consumption. Military research leads to new types of planes, ships, vehicles, guns, and armament, and national security necessitates that these be built. The production of this equipment takes vast quantities of metals. Industrial research leads to new and improved products, which also must be built. Metals again are required.

Even research in agriculture, foods, biology, and medicine leads inevitably to the increased consumption of metals. It takes metals to build farm equipment, just as it takes metals to build airplanes and tanks. A plant to manufacture a new food product or a new antibiotic imposes demands for metals the same as a plant to manufacture lumber or brick. Thus, the magnitude of future markets for metals is directly related to the magnitude of our total research effort.

This leads to the question: "Will research continue to expand and grow or is the present high rate of activity but a war-induced phenomenon?"

When we plot a growth curve for total U. S. research, going back to the mid-thirties, we make a very interesting observation. This curve, unlike the growth curves for the production and consumption of materials, does not go up and down. The line is completely free from peaks and valleys. It rises gently at some spots and rapidly at others, but proceeds always upward. Each year, we have spent more on research than in the preceding year. Even following World War II, there were no lapses in research activity.

The conclusion one is led to is that research at no point yet has saturated its potential. It rises uninterruptedly year after year because its cost is so slight, and its benefits so great, that it has not become subject to general economic fluctuations. Last year, the cost of all research, including heavy expenditures for military research, amounted to less than one percent of the value of the country's total production in goods and services. Obviously, there is a vast margin for research expansion before it reaches the point of diminishing returns on the general industrial balance sheet.

Seek a Practical End

These factors — the uninterrupted growth of research and its distance as yet from its potential—lead research people to feel highly optimistic about the future. Even if the government should back out of its present role in the research picture, it seems highly likely that industry would quickly take up the slack. The benefits of research have been so well demonstrated, and they cost so little, that any back-tracking is almost inconceivable. Thus, this great force that creates ever-expanding demands for metals seems to be assured of a dynamically progressive role in our economy for a long time to come.

Points to be considered when one is appraising the probable effects of research on the future economy are the size of our research establishments and the attitudes prevailing in American research. The way research has developed in this country as a force for industrial progress is impressive. We not only have a total establishment consisting of nearly 4000 industrial research laboratories, a dozen or more private industrial research institutes, well over a hundred industrial research foundations and engineering experiment stations affiliated with our universities, and more than 300 governmental laboratories, but also a philosophy about research that is different. We almost invariably regard research as a tool for accomplishing results. In most other countries research is thought of as an intellectual pursuit that may or may not be useful in the practical sense. Even when we do fundamental research, with the minor exception of some work done in universities, it is always *directed* toward some practical end. This characteristic—so typically American —has been largely responsible for our industrial growth, and it will work in the future to assure continued growth.

The organizations that have been developed in this country to bring the benefits of research to all companies —including even very small companies —help further our progress. Commercial laboratories, university foundations, and research institutes give tremendous strength to our research arm. These organizations make it possible for companies to gain all the benefits from research without tying up capital in laboratories and equipment. This year the research institutes alone will conduct approximately $50,000,000 worth of industrial and military research. Much of this will be for companies that otherwise could not afford research, or would not have available the staff and facilities for doing this work.

Research is growing in its effectiveness as well as in volume. A few decades ago, research people talked about how many attempts they made before they hit upon the lucky try that brought the desired results. Modern business doesn't take kindly to courageous attempts alone; it wants direct and speedy results. This means that research programs must be planned toward industrial objectives—that as much science should be expended in planning them as in executing them. Through diagnosis of the factors involved in an industrial operation and by the use of the sciences of engineering economics and operations research, modern research planners can outline research programs best calculated to lead to desired technical and economic results. Mineral companies, faced with problems of supply and markets, should consider how well their research programs are planned.

What Would 2.5 Percent Produce?

The metals industries have always been progressive and they support an appreciable proportion of the country's total research bill. However, statistics show that these industries are not expending as much on research in proportion to dollars of sales as are some other industries. For instance, according to a report released by the Bureau of Labor Statistics early this year, the primary and fabricated metals industries are spending about 0.6 percent of their total sales on research. The chemical industry, by contrast, is spending 2.5 percent—or four times as much. Perhaps, because of the differences in the natures of the two types of businesses, it may never be necessary for primary and fabricated metals to spend 2.5 cents of its sales dollars upon research. One wonders, however, what progress the metals industries would make if they stepped up their research efforts to a degree comparable with that of the chemical industry.

The horizons for minerals are bright. Research, both within the minerals industries themselves and within hundreds of other industries, is working to make the horizons even brighter. Research is truly the foundation for minerals progress.

Deep Well Pumps in Mining–Part I

Top driven pumps have the advantage of easy access. These three drain an area of 8000 acres and have a capacity of 5000 gpm each

A Tool Comparatively New to the Mining Industry Finds Increased Acceptance as Its Potentials Are Realized

By E. I. McGEE
Registered Mechanical Engineer

VERTICAL turbine pumps for deep well pumping are finding wider and more popular acceptance among mining men. Reasons for this trend are numerous.

The mining industry needs this pump because more mines are going deeper and deeper.

Rare indeed is the coal mine of today that does not have to get rid of considerable quantities of water. In most cases the water is acidulous and rapidly destroys any but the best of materials, and this usually means very costly materials.

With the advancement of the centrifugal pumps in other industries and high speed rotary motion offered by the electric motor already becoming acceptable to mine use, the centrifugal pump naturally found its way into the mines. However, its introduction for handling gritty, acid mine water brought lots of headaches to both mine operator and the pump manufacturer.

The writer clearly recalls one prominent manufacturer of steam, air and electric driven reciprocating mine pumps who refused to consider building any other kind. He even refused to be concerned about other manufacturers trying them in the mines. He said, "They will try them but will be glad to come back to the present type." His descendants still build mining equipment of many kinds but do not build pumps.

The size, simplicity and cost of a centrifugal pump, when compared to old style pumps for a given capacity, made the centrifugal a necessity. Larger mines, more water and higher heads would have required the old type pumps to be too large and costly to be tolerated. But with large underground pump stations and high powered, high voltage motors came large and costly underground electric control stations and all the accompanying hazards to both man and property. However, these conditions seemed so much better than those that had been acceptable only a few years before, that neither the mining industry or the manufacturer seemed to get the urge to provide something better.

The first need for a deep well pump was felt after a well established mine had been flooded out and all pumps, motors, mining machinery, locomotives, cars, etc., were under water. The only way to dewater the mine was to start at the top and pump down. The vertical deep well type of pump seemed to offer a natural solution, as it could be hung in the shaft. Unfortunately, manufacturers of the pump were not prepared to furnish them for acid mine water and it took time and hard work to redesign their products for this condition. They went at it willingly and energetically and in a much shorter time than it took for the original centrifugal pumps, the vertical deep well has found favor in many cases where either type could be used.

Factors to Consider

There are several factors that might dictate the selection of a deep well pump over another type.

The first cost of the deep well type might in some cases be considerably more than the cost of an underground pump of the conventional type. If the cost of a long discharge line and an

underground pump room and control room is added to the underground pump, first costs might be comparable. Where underground labor rates are higher than surface rates, the preference begins to lean toward the deep well type; especially if the underground station is some distance from the mine portal. If the mine is one that might become nonproductive in slack seasons but must be pumped daily, the deep well pump can be operated without the need of anybody going into the mine. This in turn might reduce other costs, such as operating a hoist and a fan and maintaining daily inspections. A slight roof fall in an idle mine might make the underground pump inaccessible long enough to lose it by flooding, or worse yet, might trap the lone attendant on the wrong side of the fall.

Many times it is necessary to drain a mine, or a section of a mine, to allow another mine, or another section of the same mine, to continue production. If there is no practical means of access to the water, a deep well pump is a necessity—almost regardless of the cost. If there happens to be a mine shaft in the pool or sump, or near enough to it and low enough that water can reach it without having to rise high enough to be troublesome elsewhere, the problem is simple.

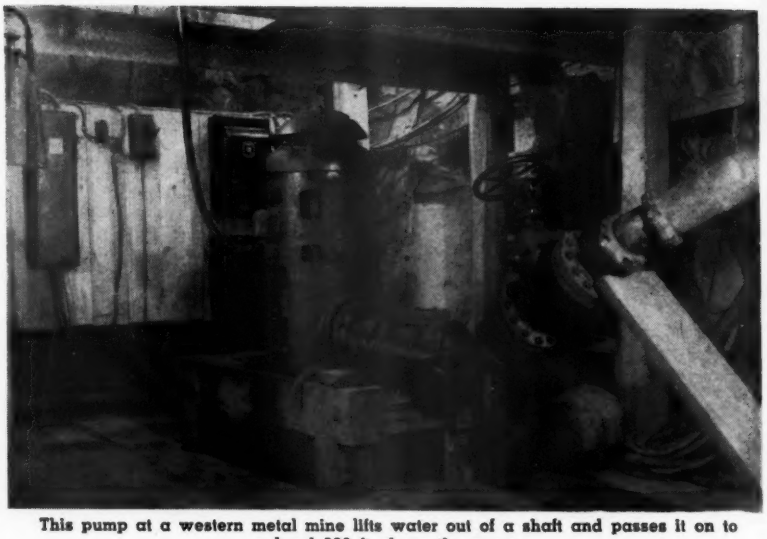
Most deep well pumps hang in shafts, either active or abandoned, but many are being hung in bore holes. Very few bore holes that were put down for other uses are large enough or straight enough for hanging a deep well pump of large capacity. But the cost of a new large bore hole directly into the pool might not be as much as the cost of ditching water to an existing shaft.

All these, and many other factors that will come up in the study of each problem, will help determine if the deep well pump is preferred to another type.

Several Types Available

There are several general types of deep well pumps, each with different features that are favorable to different conditions. Nearly all can be used with different types of drives. Steam engine drives are not common, but usable.

The simplest and least costly of these pumps is the water lubricated, open impeller combination. Past experience, however, dictates its use for comparatively short settings (distance from intake to outlet) only. They do a wonderful job on very short settings, but because the open impeller derives its efficiency from having a minimum running clearance between the bottom of the impeller, i. e., the open edge of the vanes and the adjoining face of the bowl, it is easy to see that a slight change in the relative lengths of the long shaft and the long column would rapidly affect its operation.



This pump at a western metal mine lifts water out of a shaft and passes it on to a level 580 ft above the pump

If a pump hangs in an open shaft where temperatures might vary from zero to 80° F in a down cast shaft and the mine water is usually about 60° F, it is evident there would be a rapid change of temperatures between the outer column and the inner shaft from idle to running periods. There could easily be a difference of 30° between shaft and column temperatures which would change the relative lengths of a 200-ft setting by ½ in. The hydraulic thrust of the impellers would then stretch the average shaft about ⅛ in. in 200 ft and the load of water would stretch the column about half as much between the idle and running lengths. With these factors in mind I would not recommend an open impeller type for settings as great as 100 ft because it would be impossible to guess when the impeller setting was reasonably close. A closed impeller type pump is more consistently efficient in longer settings.

Water lubricated, stainless steel shafts running in rubber or other nonmetallic bearings give very good service in moderately short settings. In settings of more than a few yards, however, provision should be made to prelubricate the bearings with water before starting the pump after it has been idle for more than ½ hr. Most of these pumps run at 1760 rpm and the shaft instantly throws off any water that does not find its way into the top of the bearings, so that only a few seconds of operation dries out the bearing which heats up rapidly. Most pumps will fill their column at a rate of about 300 fpm and the bottom fills up faster than the upper part. This indicates that pumps with up to possibly 200-ft settings can be operated safely with water lubricated bearings without the need of a shaft tube.

Depending upon the characteristics of the pump and the column, any setting greater than 200 ft would probably burn out the upper bearings of a closed impeller, water lubricated pump in a short while where periodic pumping called for frequent starts. However the simpler, lighter and cheaper construction of this pump prompts its use as often as possible.

If hollow shafting was not so costly and so difficult to balance at high speeds, the writer would advocate its use. Then lubricating water could be supplied to each bearing continuously upon starting until the column filled and flow was established.

Oil Lubricated Pumps

Oil lubricated pumps are more complicated, more costly, heavier and more difficult to install because of the addition of an oil or shaft tube. The column and shafts are usually made up in ten-ft sections while the tube is usually made up in five-ft sections with a bearing at each joint. The tube is made of extra heavy pipe with an inside diameter liberally larger than the shaft coupling sleeves. It is coupled by internal nipples threaded into the tubes. These nipples are bronze bushed to form shaft bearings. Tube ends are carefully faced and threaded to screw tightly together and make a water pressure tight joint, one which will keep water out and oil in. Oil is fed into the tube at the top and finds its way downward by gravity or pressure through each successive bearing or auxiliary bypass around each bearing to the top of the pump where it can escape out of ports cored through two or more straightening vanes in the top stage bowl of the pump to the pool or sump.

Trouble can start at these escape ports. Excessive oil escaping into the pool will rise to the surface. If the

pool is not pumped low enough to occasionally allow oil and water to mix and be pumped out, the pool will probably at times be high enough to allow oil to reach the rubber column covering with which most pumps are supplied near the bottom to prevent acid water attack. This accumulation of oil might also become a fire hazard under some conditions.

It would seem that pump manufacturers would tap the bottom of the oil tube and conduct waste oil to the inlet below the first stage impeller. This might lead to the need of an oil resistant column lining, although it is doubtful if the small amount of oil in a large quantity of rapidly moving water would cause trouble.

Some engineers have suggested that pumps with shafts in shaft tubes within the column be arranged for water lubrication from an outside source. This seems to be a practical solution. Stainless steel shafting would be called for, but it has been found that even with oil tubes and oil lubrication, stainless steel shafting is worth the difference in cost, because carbon steel shafts rust and destroy the bearings.

To avoid all this, at last one well known pump manufacturer has built pumps with the drive shaft outside the water column and with oil or water piped to each bearing. To build a balanced pump, one that would hang vertically, two water columns were used with the bearings supported between them. It was intended that the bottom shaft bearing would always be above the water in the pool, but in case of occasional submergence, this bearing could be water lubricated from an external source, or all bearings could be made for water lubrication. Columns are connected at the top to a common outlet and at the bottom to a double volute type of impeller bowl. The pump has many good features, but is too bulky to be installed in a moderate size bore hole and requires almost twice as many pieces of column pipe to be assembled. The total weight would probably be greater, but the separate parts should be lighter and the pump might not take any longer to install than other types.

Bottom Driven Pumps

To avoid long drive shafts, oil tubes, multiple bearings and the extra dead weight on the thrust bearings, several well known manufacturers build pumps with the motor connected directly to the pump at the bottom of the column. The motors are of long slim proportions and have to be permanently sealed against the entrance of water through the bearings. The exterior of the motor has to be acid proof as it is submerged in the water. One type has the motor above the pump and in the water column, which means the column must be extra large to allow water to pass around the motor at high pressure and higher than normal velocity.

Other types have the motor below the pump, suspended in the sump where there is not much pressure or velocity. Some of both of these types are arranged so that motor and pump can be withdrawn without disturbing the column. The power cable, combined with a lifting cable, is acid water proofed and it should prove to be a small job to remove, repair and replace the pump and motor.

One big part of removing or replacing a top driven pump is the handling of the many pieces of column with several heavy bolts in each flange at ten-ft intervals and the breaking and remaking of the threaded joints in the tubing and shafting. Larger pumps require such heavy tools for the latter parts of this operation that it is a slow and costly job. Many pumps of moderately large capacity and with 400 to 500-ft settings require seven men, seven shifts to remove and eight shifts to replace. Needed repairs might be trivial but there is no other way to make them except to pull the pump. If the submerged motor does not call for too much extra maintenance, it could be justified. However, we have known some of the older types to run over six years without any repairs. By that time the column needed cleaning and repainting outside where it was not rubberized. Hence, if the purchase of a submerged motor type is contemplated to save pulling the column when pump repairs might be needed, unusual care must be given to be sure the column is fully protected against any and all kinds of damage from acid water, both inside and outside.

For a given capacity centrifugal pumps are smaller and simpler than older style pumps

Versatility Advantageous

It is well to keep in mind, when buying, that after the pump has served one purpose, frequently, with minor changes, it can be used for some other job that is quite different. Many pumps bought for a deep well setup were retired after that job was finished and then again used at some other site where the shaft was not so deep, or in other cases, in a deeper shaft. There are, of course, limitations to the latter conditions, but not so many to the first condition. In a more shallow setting, the motor might be larger than necessary and therefore slightly inefficient.

In one case the author recalls, columns had deteriorated because of not being sufficiently protected against

strong acid water, and the pumps, motors, motor supports and bases were coupled close or with a very short adapter and used underground to pump water up bore holes that developed as much head as the pump could handle. The only alteration needed was to provide deeper stuffing boxes to withstand the higher pressure. When used as a deep well setup, there often is little or no pressure.

Care must be taken in an alteration of this kind to learn the type of radial bearing used at the bottom of the motor. Some pumps, when short coupled, have a tendency to lift the impellers momentarily just for the instant of taking water and before pressure it built up. This could disarrange some types of thrust bearings in the top of the motor. The motor manufacturer should be consulted.

In juggling pumps around for different requirements, careful study must be given to the manufacturers' performance curves. Two pumps from two different factories built for 1600 gpm at a 380-ft head were reclaimed after being set aside. After adding another stage to each from spare parts on hand at the mines and making longer impeller shafts, they served very well to help dewater a flooded mine by handling 1100 and 1200 gpm each at a 420-ft head without fully loading the original motors. We were tempted to add two more stages to one to pump more water because we had the parts, but this would have slightly overloaded the motor. Since no spare motors were at hand it was decided to take no chances on a breakdown. Fortunately, extra column pipe and drive shafts from a spare pump were on hand.

A pump when transferred from a deep to a shallow shaft will handle more water, but here again the curves must be studied. The characteristics of some pumps would overload the motor. In other pumps the motor might not be overloaded, but, depending on how deep the pump is submerged, the excessive volume handled might cavitate in the first or first and second stages and quickly ruin the impellers or bowls or both. It is advisable to reassemble the pump with fewer stages and make a new or shorten the pump shaft accordingly. However in emergencies, if time or facilities are not at hand to make or aler the shaft, it is practical in some pumps to leave out the unwanted impellers but use all the bowls. The first stages of impellers, i. e., the bottom impellers, should be used, leaving out the correct number of top impellers.

Types of Drives

With the exception of the bottom driven pumps, any of the foregoing pumps can be driven by any one or a combination of several types of drives. The simplest of these for larger pumps is the vertical hollow-shaft motor directly coupled to the drive shaft just about the stuffing box in the top outlet ell.

The solid shaft vertical motor can also be used and is usually applied to smaller pumps. In past experience motor manufacturers seem to draw the line between solid and hollow shafts at 200 hp but I suspect there are variations from that. Motors of this larger type are usually 2300 v, ac and run at either 1160 or 1760 rpm as needed by the pump.

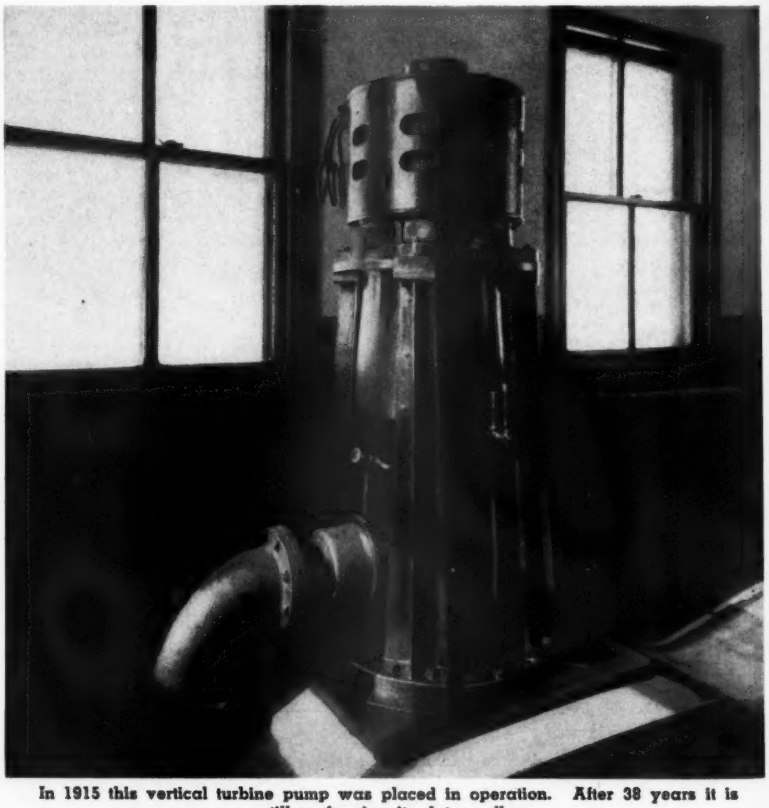
Conventional horizontal motors, gasoline or diesel engines, steam turbines, or if necessary, steam engines, can be used to drive vertical pumps in several ways. In larger sizes, the bevel gear transmission is adaptable to any one of the horizontal power sources, preferably directly connected by flexible couplings. In smaller sizes the conversion from vertical to horizontal rotary motion can be accomplished by a quarter turn flat belt or multiple V belt drive. This might cost less than the bevel gear transmission but would require more maintenance than a properly selected transmission.

Most turbine pumps are designed to run at the moderately high speeds common to 60-cycle motors, i. e., either 1160 to 1760 rpm. In larger pumps for deep settings there is some doubt as to the wisdom of 1760 rpm and some of the more conservative manufacturers refuse to quote on 1760 rpm for depths of 500 ft for 500-hp motors. Other manufacturers will quote both ways and take a reasonable stand on a guarantee but leave the selection to the buyer.

Higher Speeds Possible

Naturally, the slower speed pump and motor costs more to build and is heavier and more costly to install. The critical point of high speed pumps is generally the drive shaft and the thrust bearing. The pump proper and the motor can take it. Pump manufacturers seem to have adopted five-ft bearing spacings for oil lubricated and ten-ft spacings for water lubricated bearings, regardless of the shaft diameter, depths, speeds or horsepower. Just why is hard to find out. They speak vaguely of shaft-whip, vibration, harmonic rhythm and other terms beyond the knowledge of the average engineer.

The writer persistently asked the designing engineer of one of the best pumps why a 3½-in. shaft for 600 hp at 1160 rpm had to have bearings every five ft for 430 ft. The answer was that scientific studies proved the necessity of it—the shaft would whip with ten-ft spacings and if built with ten-ft spacings and a bearing failed, there would be a 20-ft space. The sug-



In 1915 this vertical turbine pump was placed in operation. After 38 years it is still performing its duty well

gested pump was bought. It ran smoothly for about five years and was finally removed and dismantled. Everyone concerned was quite surprised to find that, because the tube had loosened on its threaded nipples, water had gotten in near the top and ruined nearly every bearing. In over 150 ft, in one stretch, there was nothing left of the bronze bushings. They had ground out and were in a mass of powdered bronze in the bottom of the tube.

With experiences like this, and with the manufacturers' experience in better design, better lubrication and, most important, better balancing, there is less fear of higher speeds. Three five-year-old pumps in one installation using 400 hp and pumping from a 550-ft depth are running successfully at 1760 rpm. Another, at the same location, made in a different factory, failed in less than two years. It was a 500-hp pump and also ran at 1760 rpm. Indications are that the failure was due to faulty workmanship in the factory because several discrepancies had to be corrected during the installation.

In many cases a deep well pump can mean the elimination of long discharge lines

One of the vital parts of any drives is the very necessary thrust bearing to carry the weight of the motor armature and the long drive shaft in the top driven types and the hydraulic thrust of the impellers.

Unfailing lubrication, with the proper lubricant, and proper cooling of a bearing is needed at all times. This requires a careful operator. One that will keep records of the running time and see that the oil is changed according to the lubricant manufacturer's recommendations.

Specify Pump Duty

Whether a mining company contemplating the purchase of a pump has a well organized Purchasing Department or if some of the plant personnel will handle negotiations, it is almost a necessity to have well prepared, written specifications so each bidder will be able to study the requirements and make his best offer in his first quotation. There are so many variables in deep well pump requirements that the bidder deserves all the information he can get. If he has to work in the dark there is delay and confusion that can be costly to both sides.

An inquiry should always state definitely the following facts:

Quantity per minute and per day to be pumped. (In U. S. Gallons.)

Expected frequency of starts and stops.

Kind of water to be pumped, its acidity or alkalinity, whether gritty, silt laden or debris laden, and its temperature.

If a loss of lubricating oil into the mine is objectionable and if clear water is available for lubrication and cooling of shaft bearings and cooling of thrust bearing lubricant.

Minimum and maximum distances from the water to the surface on which the pump will rest.

Mention if allowance is included for 20 to 30-in. supporting beams if the pump sets over a shaft.

Heights to which the water will be discharged above the pump supporting surface.

Type, length and size (if already established) of the discharge pipe to where the water is liberated.

Distance from bottom of the sump to the pump supporting surface. (For manufacturer's decision of type of strainer and depth of pump submergence.)

Kind of power available, voltage and cycle if ac.

If the customer has a motor or other power he prefers to use, he should give the type, speed, horsepower shaft-size and any dimensions that would limit sizes of pulleys, couplings or clutches on engine drives.

Whether the pump will be suspended over a shaft or in a borehole.

If more than one pump is needed, give the shaft size.

If in a bore hole, give minimum inside diameter of casing and maximum deviations from being straight and from a vertical line.

State if bore hole is not vertical at or near the top.

If the bore hole is yet to be drilled, let the pump manufacturer recommend the size of the hole and tolerance.

If the pump will have a full time attendant or will need automatic or semi-automatic controls.

If the motor will or will not be sheltered.

If the customer or manufacturer is to supervise installation.

If the customer has facilities for installing the pump or should the manufacturer install it. (If the manufacturer is to install the pump he should be told if there is a headframe over the shaft or borehole.)

If the customer wants to witness a factory test.

If the customer wants to test the pump for efficiency while the factory supervisor is still on the job.

Beyond the points mentioned there is a great range in details that the customer should discuss carefully with the bidder as to the need of certain features vs cost, long life vs cost, and efficiency vs cost.

Among these should be mentioned briefly:

Type of column lining for acid water.

Type of and how far up the column should be covered outside for submergence and also for splash in wet shafts.

Type of flanges and bolts to resist acid water for submergence or splash.

Type of oil tube (where used) whether stainless steel or acid protected carbon steel.

Type of shafting, whether stainless or carbon steel in an oil lubricated job.

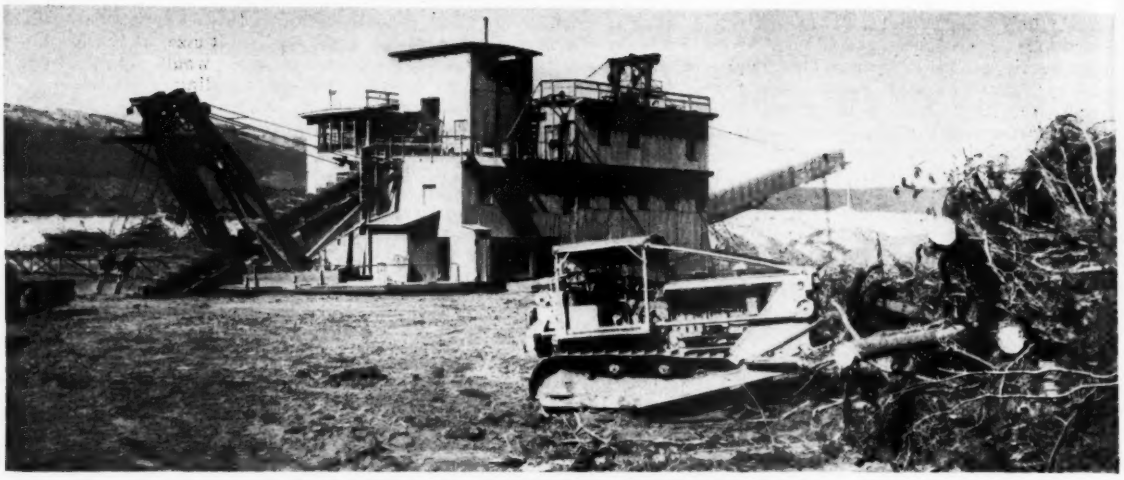
A non-reversing rachet stop vs reverse speeds in excess of speeds for which the motor is wound.

Tube stabilizers in oil lubricated pumps vs a crooked bore hole.

Several short sections vs chairs under the base to vary relation to depth of sump.

A ratchet spanner wrench type of barring device for rotation by hand.

Other points of importance, that should be considered before the final purchase is made, will be mentioned in a later article.



A crawler mounted tractor clears the way for dredging operations

New "Golden" Age Dawns in Idaho's Rare Earths*

DAWN of the jet-atomic era is transforming the hills of Idaho into a busy place. In the Cascade Basin, north of Boise, and in other abandoned gold fields in the Far West titanium and monazite sands have been found.

Dredging for monazite may never be as colorful as the gold sluicing of the last century. But, although costly, difficult methods are required to win monazite from the rivers and creeks once sluiced for gold, value of today's developments may well lead all others in the Gem State's great mining history.

Titanium comes from the mineral ilmenite which, like zircon and garnet, is found with monazite sands. Approximately 80 percent of the skin of Douglas Aircraft Co.'s DC-7 engine nacelles will consist of titanium sheet. This and other applications of titanium—it has the strength of steel yet weighs only half as much—will result in a weight saving of about 200 lb per airplane, equal to one passenger and his luggage.

Monazite is a complex mineral which contains many rare-earth elements, often including thorium, an atomic material of considerable importance. Because of it, monazite production is controlled by the Atomic Energy Commission, producers must have an AEC license and sales are subject to the commission's approval. Current production is only about 2800 tons a year and planned production of 25,000 tons by 1956 falls far short of needs.

Despite the important mid-century uses of monazite, commercial production of rare-earth minerals began in 1885 with the manufacture of thorium nitrate for use in incandescent gas mantles. At that time, the rare earth was a by-product of the refining of thorium. With development, the demand for rare earths increased and thorium became a by-product until its fissionable properties were discovered.

Significant amounts of monazite were dredged in the Carolinas and Florida until 1909. (Strangely, iron ore held in New York's Adirondack Mountains lay idle for many years because the ore was "contaminated" with titanium.) From 1909 until 1949, the United States imported most of its monazite sands with 75 percent coming from the beaches of Travancore, India, and the remainder from the states of Espirito Santo, Bahia, and Rio de Janeiro in Brazil.

India Cut Supply Off

When India clamped an embargo on monazite exports to the United States, American manufacturers began searching for domestic supplies. It is not yet concluded, but the quest to date has resulted in the activity in Idaho which may well write a new chapter in Idaho's already bright mining history.

Besides strategic thorium, monazite sands yield these rare-earth metals: Lanthanum, cerium, praeseodymium, neodymium, samarium, europium, gadolinium, terbium, dysprosium, holmium, irium, thulium, ytterbium, and lutecium.

Cerium, most common of the rare earths, is used in diverse compounds such as rouge for polishing optical glass and spectacle lenses. Cerium compounds like rare-earth chloride can make textiles mildew, moth and water proof.

The brilliant lights before TV cameras which wilt performers and politicians alike have rare-earth oxides and fluorides in the carbon cores—the color quality matches that of sunlight. Thorium nitrate is used to make thoriated filaments for electronic tubes.

In the production of high-grade steel, these metals improve the rolling qualities, help to clean, filter and strengthen aluminum and magnesium. The Germans during World War II found that alloying 0.3 percent misch metal (an alloy of rare-earth metals) with magnesium vastly improved the forging and heat-resistant qualities of airplane parts. Remarkable properties are being discovered in titanium

Howard E. Kremers, director of research for Lindsay Chemical Co., sifts the fine, golden brown sand through his hands. Lindsay processes about 85 percent of the monazite sands mined in the United States

* Article and photographs furnished by Caterpillar Tractor Co., Peoria, Ill.

Leveling the tailings for planting is the final step in the monazite operation's course through the Cascade basin

Concentrates are shipped by railroad to Boise

alloys. Although it poses complex production problems, America's metallurgists are looking for a way to use it because its strength, lightness and resistance to corrosion promises revolutionary changes in future machines.

Many Uses for Rare Earths

Titanium oxide has become widely used as a paint pigment. Zircon is used in ceramics and refractories. Zircon brick makes the highest-temperature furnace lining known. Zirconium is used in surgery for bone splicing. Garnet is used chiefly as an abrasive. As a matter of fact, it is said that from the standpoint of uses for the rare-earth group and the other minerals that are found with them, the surface has scarcely been scratched.

In view of this, Idaho's monazite sand, which miners cursed in 1862 because it looked like gold and clogged the riffles in sluice boxes, may be more valuable than the gold first obtained.

Prices are the highest ever. A short ton of American-produced sands in 1922 brought about $180. The price then slumped and even during World War II, was never higher than $60. Last year, the price began climbing and currently is reported to be about $375 a ton for sands containing 65 percent rare-earth metals. Geologists say some of the metals that can be extracted from monazite are worth up to $1 a milligram, an amount barely enough to cover the head of a pin.

But the need is there. Methods, necessarily, are as modern and efficient as the technology which monazite feeds. Keynoting this, the miner's pick and shovel has given away to powerful machines; instead of dams and sluices, there are three 1000-ton dredges in the mile-high Cascade Basin.

In the vanguard is one of the biggest timbering operations in the state's history. J. I. Morgan, Inc. of New Meadows, Idaho, is logging approximately 4,000,000 bfm annually in clearing ahead of the dredges. This involves brush and pine up to ten in. and stumps up to three ft in diam.

Three Companies Active

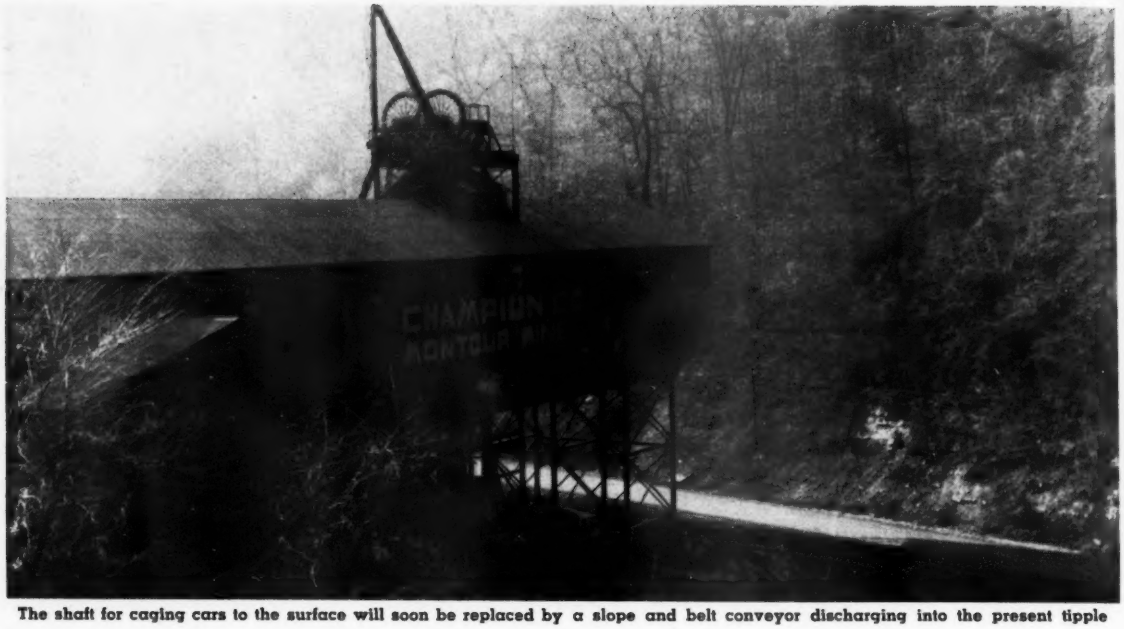
Three companies — Baumhoff-Marshall Co., Cascade, Idaho; Warren Dredging Co., Boise; and the Idaho-Canadian Dredging Co., Cascade—are operating electrically-powdered dredges in the district. In all operations, the tailing piles are levelled off so that the land may eventually be seeded to grass and grain crops native to the area.

The big dredges each handle from 4000 to 6000 cu yd of gravel a day on around-the-clock operations. Endless chains of buckets bring the material to the surface from a maximum depth of 70 ft and the loads are dumped at the rate of 24 buckets per minute. The heavy monazite is separated from the gravel and earth within the dredge by screening and jigging. From the dredge, the heavy sand is trucked into Cascade for rail shipment to a separating plant in Boise that is owned jointly by the three dredging companies. After drying, the sand is placed on a belt and run through a series of magnets of varying degrees of intensity to separate the monazite, zircon, garnet, and ilmenite. From every 4000 tons of gravel dredged, about 30 tons of heavy sand concentrates are recovered. This 30 tons yields approximately two tons of monazite, from 20 to 25 tons of ilmenite and the balance in zircon, garnet and silica.

The monazite is bagged and shipped either to government stockpiles or to the Lindsay Chemical Co. in West Chicago which produces about 85 percent of the rare earths available in the United States.

Known monazite deposits in Idaho indicate 25 years of operation at the present production rate. Thorium, its current uses clouded in atomic secrecy, is likely to become valuable as commercial atomic power develops. Cerium and the other "ium" compounds are essential elements in many manufactured articles. Titanium and magnesium alloys, bolstered by the magic misch metals, seem destined for an increasingly-vital place wherever industrial and defense needs demand strength, lightness and durability.

Ditches have to be constructed to handle dredge float water



The shaft for caging cars to the surface will soon be replaced by a slope and belt conveyor discharging into the present tipple

Montour No. 4 Changes Mining Method

Increased Production and a Decrease in Labor Force Accompany Switch from On-Track to Off-Track Mining

HOW do you convert a high cost coal mine into one able to maintain its competitive position against all comers? This problem faced Pittsburgh Coal Co., Division of Pittsburgh Consolidation Coal Co. at its Montour No. 4 mine. It is a question many mine operators must ask themselves today. Here is how Pittsburgh Coal answered it.

Montour No. 4 is located near Lawrence, Pa., about 13 miles south of Pittsburgh. It is a shaft mine in the Pittsburgh seam. Coal, the mine over, averages about 62 in. high overlain by three to 12 in. of the drawslate so typical of the Pittsburgh seam. There is an average of 13 in. of roof coal above the slate. The mine was opened in 1914. Until recently it was operated as a track mine with ten face crews and units producing between 2700 and 3000 tpd of clean coal, operating three shifts a day. Now, using off-track equipment, the mine is producing an average of 3100 tpd of clean coal with four units, triple shifted.

Old Mining Method

To show best what changes were made at Montour 4 to produce these results, it would be well to describe first the old mining plan and then the new. Under the old system coal was mined by the conventional room and pillar method. Four butt entries were driven on 50-ft centers 12 ft wide. Off these, 14-ft rooms were turned on 54-ft centers. Full-seam mining was practiced and pillars were pulled on the retreat. All equipment was track-mounted with the exception of the crawler mounted loading machine. Coal was cut by Goodman CJ 512 short-wall cutting machines and loaded by Joy 14BU loading machine directly into steel cars holding five tons of raw coal. Holes were drilled with post mounted C-P 574's and the coal was shot with Cardox. Slate was broken with permissible powder. Timbers installed according to a predetermined plan supported the roof. This was the system that produced 2900 tpd of clean coal with ten face units, working triple shift.

Go to Off-Track Mining

One of the first changes made was to substitute off-track for on-track mining. The 14BU loading machines were maintained for loading. Short-wall cutting machines were transferred from track-mounted trucks to Joy T2 "cat" trucks, and 10 SC shuttle cars were installed to carry coal from the face to mine cars.

Getting the shuttle cars into the mine posed quite a problem; they were too large to be taken down the shaft in a regular manner. The question was finally resolved by hanging them on end beneath a cage, dropping them down the shaft, and skidding them out on their sides at the shaft bottom. They were then righted and towed into the working sections.

Coal and slate are now drilled with C-P 580 drills mounted on three-wheeled Lee-Norse trucks. Airdox has replaced Cardox and permissible explosives for shooting on the section. Roof bolts are the primary method of roof support, having replaced timber in all but pillar recovery work. Baker-Fletcher roof bolting units are used.

Modify Mining Plan

The mining plan has also been modified considerably. On the advance, seven 14-ft entries on 54-ft centers are driven. Square breakthroughs are driven on 108-ft centers. No rooms are turned, and retreat mining consists only of pulling the entry pillars. A 40-ft barrier pillar is left between sets of butt entries on the advance. It is mined on retreat. Pillars are mined open end in 18-ft lifts, four cuts to a lift. The last 20 ft of each pillar is mined from the breakthrough.

After the change to Airdox for shooting, experiments were made with different patterns for blastholes. It was finally decided to use two long snubs, one short center snub and two coal holes in 14-ft entries. Three holes are used in the slate.

The short-wall cutting machines have an 11-ft cutter bar, which gives an effective 10-ft cut, and are equipped with bug dusters. Water for dust suppression is supplied to the cutting machines through pipelines from sumps on the main motor road. At the present time, one high-pressure pump serves three loading units in one area of the mine. A fourth unit is far removed from the others and has its own pump.

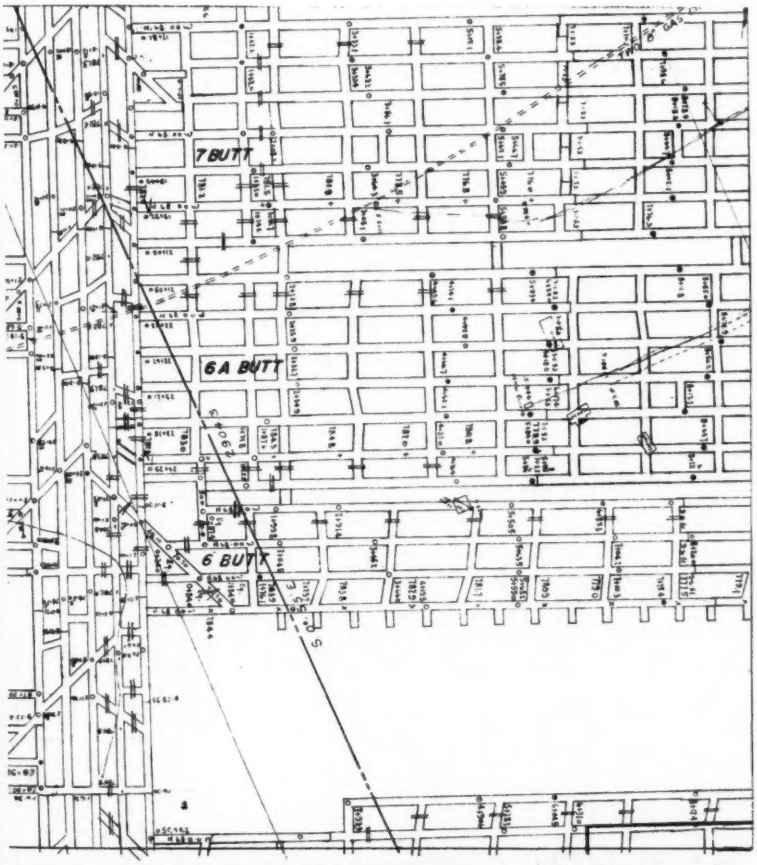
From the loading head, water is carried to the cutting machines through a rubber hose. This allows flexibility and permits a constant supply of water at the machine. When using track-mounted units, water was supplied from tanks mounted on the cutting machine truck.

An average crew is made up of 12 men as follows:

1 Loading Machine Operator
2 Cutting Machine Men
1 Driller
1 Shot Firer
1 Roof Bolter
2 Shuttle Car Operators
3 Utility Man
1 Section Foreman

This is the makeup of a crew advancing. On the retreat, the roof bolter and the utility men are converted to timbermen.

Drills have been mounted on three-wheeled trucks



Section of mine map showing old and new mining plan. Note: The room necks turned off 6 Butt. Six A and 7 Butt are driven on the new mining plan

Taking Full Seam

Full-seam mining is practiced. Everything from the bottom of the seam up to and including the draw-slate is loaded out. Cut maps are furnished each section boss to enable him to keep better control of the pillar line when on the retreat. At one time these cut maps were numbered to show the proper sequence in which to take cuts of coal, but now they are left unnumbered and it is up to the face boss to develop his own sequence. The responsibility of keeping the pillar line straight is his alone.

Cut maps also are of great assistance in showing exactly what coal is to be left as reserve. The mine operates in a rapidly developing area and in many cases coal is left in place for support of highways, pipelines or buildings.

On the advance, loading heads are established every second breakthrough. This generally necessitates shooting down some roof to give the boom of the shuttle car clearance above the mine cars. Track is carried up the second and sixth entries. Loading heads are established on the third entry at every second breakthrough and track is laid in the loading head breakthroughs to connect the two entry tracks. This allows uninterrupted loading, as empties can be attached to the tail end of a trip sitting at the loading head and loaded cars pulled away from the front end. Hydraulic car advancers are used to move the trips past the loading head. Controls are fastened to a post located at the loading head in such a position that the buggy man can operate them without leaving his seat.

Thirteen and eight-ton swing motors

Raw coal is taken to a central plant for cleaning. The head frame and hoist house in background are used in driving the new slope

gather coal from the working sections and place them on a main line sidetrack, where they are picked up by 13-ton mainline motors and taken to the shaft bottom. Trips average about 45 cars. Sixty-lb rail is used in the main line track, which is ballasted with slag. Forty-lb rail is used in the butt entries with steel ties. All track is bonded and cross-bonded. Mainline motors are equipped with MSA minephones and contact is made between sections and the dispatcher by telephone.

Produce Metallurgical Coal

Use of roof bolts for roof support has enabled Montour 4 to produce a metallurgical coal in place of the steam coal produced when using timbers for roof support. The roof coal, which lies immediately above the draw slate contains both high sulphur and high ash. It was impossible to hold the roof coal for any great length of time with timber after the draw slate had been shot and loaded out. When bolted, however, the roof coal stays up and does not contaminate the rest of the coal.

Bolting is practiced in entries. Expansion type bolts are installed three ft apart in rows on four-ft centers. Over 200,000 bolts have been used. Timbers are used in pillar work. The maximum pillar thickness is only four cuts, and the roof coal will stand long enough with timber support to take them out.

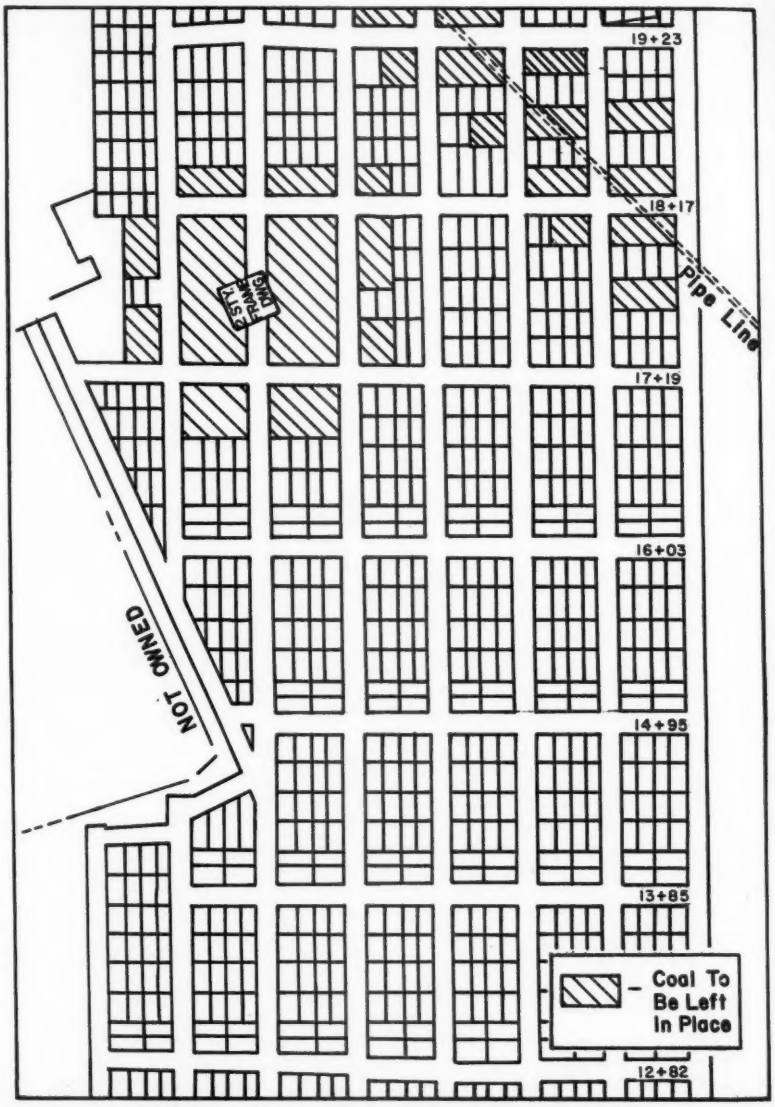
Coal mined at Montour 4 is prepared at a central cleaning plant. The only treatment of the raw coal at the mine at the present time is to scalp out the plus 14 to 16-in. product. This is generally roof slate, but large pieces of coal trapped going over the scalper are picked off the slate belt and put into a storage bin. From here they are either remixed with the raw feed or sold as house coal. Both the slate removed from the coal and that loaded out as mine rock is trucked to a gob pile from the tipple.

To Use Belt Slope

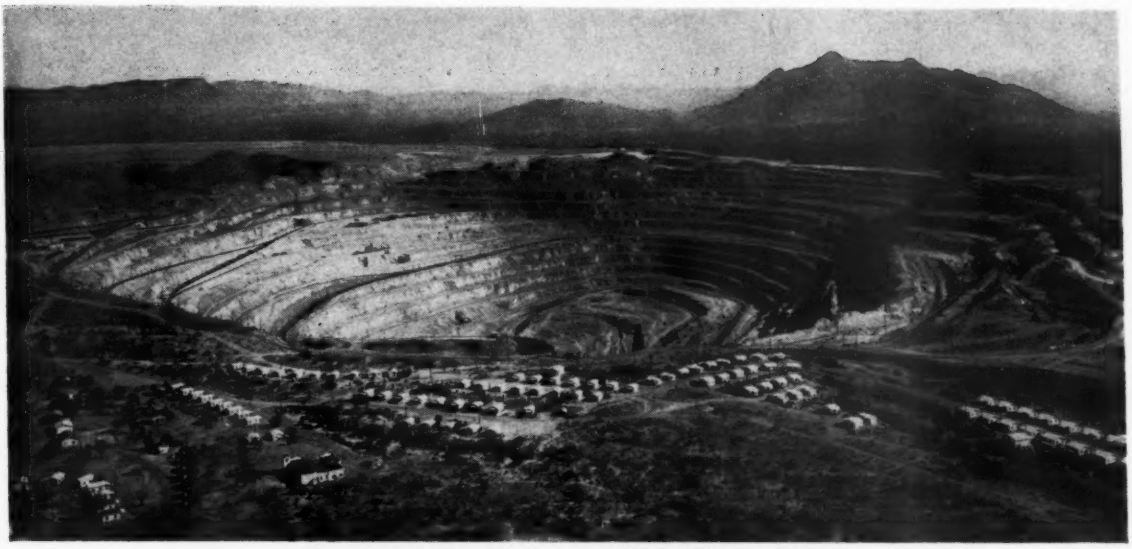
Coal is still hoisted to the surface in one-car cages, but a slope is being driven for a 42-in. belt conveyor to carry coal to the surface. The slope, when completed, will be 800 ft long on a 17° pitch. It has been designed so that the belt will terminate in the present tipple and existing facilities will transfer coal to railroad cars for its 15-mile trip to the cleaning plant. A rotary dump will be installed at the slope bottom and run of mine coal will be crushed in a jaw crusher and then fed onto the slope belt.

Both management and worker at Montour 4 are safety conscious. For the past five years mine employes have

(Continued on page 39)



Cut maps help the section boss control the pillar line



Famous pit at Ajo, Ariz., presents difficult drilling problems

Blasthole Drilling at New Cornelia

Rock Formations Determine Whether to Use Churn or Heavy Percussion Drill

By JOHN A. LENTZ, JR.
Mine Superintendent
Phelps Dodge Corp.

THE New Cornelia Branch open pit operation of Phelps Dodge Corp. at Ajo, Ariz., is being conducted in and around a disseminated copper deposit in quartz monzonite porphyry. Associated formations that come within the scope of present mining operations are rhyolite and fanglomerate. While the material being mined is considered hard, there is actually a large variation in drill-ability between the different formations as well as between different phases of the same formation. As a result of the wide range of drilling and blasting conditions encountered, there are two different methods in use for the drilling of large blast holes in the New Cornelia pit.

Practically all bank blasts are made by drilling a single line of vertical drill holes near the crest of the bank and blasting to an open face. To avoid hard bottoms or toes, holes are drilled up to 15 ft below shovel grade. In fanglomerate, three-in. toe holes, or snake holes, are often used to assist in breaking the bottom. Standard bank heights are 33 ft in fanglomerate and 40 ft in other formations.

Rock Type Fixes Drill Type

Quartz monzonite, from which approximately 65 percent of the material now being mined is taken, has been classified as hard, medium and soft for comparison of drilling results. The designation of these different hardness areas has been influenced mainly by churn drill efficiencies, powder efficiencies and fragmentation after blasting. Usually any one of those criteria is sufficient to classify this material since there is a high degree of correlation between them.

Monzonite is brittle and has numerous shatter cracks. Good fragmentation is no problem as long as a powder factor commensurate with the "hardness" of the material is used. (Powder factor as used here refers to the pounds of powder required per cu yd of burden ahead of the drill hole.)

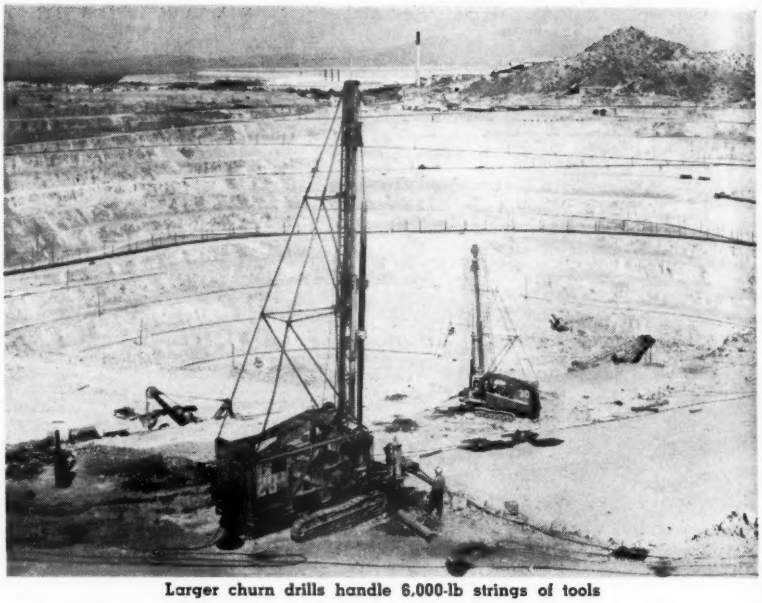
The blast hole pattern in monzonite is governed by the powder factor required for the particular material and by the size of drill hole. The bank faces normally stand with a slope between ½ to one and ⅔ to one, and drill holes less than nine in. in diameter have to be drilled closer to the crest than is otherwise desirable in order to properly "pull" the toe. However, with holes between nine in. and 12 in. in diameter, the horizontal distances from holes to toe of bank can range from 32 to 38 ft, which permits ample working room for both drilling and powder loading operations. For drill holes in this size range, the interval between holes is directly proportional to the cross sectional area of the hole and inversely proportional to the powder factor to be used. Intervals vary from as low as 18 ft for nine-in. holes in hard monzonite, to 54 ft for 12-in. holes in soft monzonite. Therefore, in this type of material, it is evident that large holes are to be preferred as long as drilling costs per foot do not increase at a faster rate than the areas of the holes being drilled.

Rhyolite is similar to the hard monzonite insofar as drilling and blasting are concerned. If anything, it is more abrasive and harder to break. Powder factors as high as 1½ lb per cu yd of burden are often required for this material. It now accounts for approximately 20 percent of total production.

Fanglomerate is a sedimentary deposit composed of extremely variable materials. The component rocks are mainly hard like rhyolite and andesite, and in some areas have been strongly

cemented together. Large intersecting fractures or jointing planes are prevalent throughout the formation, but, within the bounds of these planes, the rock is characterized by a lack of small fractures or planes of weakness and is "tough" rather than "brittle." This is the most difficult material from the standpoint of both drilling and blasting that is handled. Due to the toughness of the rock and the large intersecting fractures, good fragmentation is difficult to achieve. This material requires a fairly close hole spacing and distribution of powder in such a way that no portion of the rock to be blasted is very far from a powder charge, and therefore it has been found that holes larger than six-in. diameter are of no particular benefit in blasting.

For the purpose of comparing drilling results, the fanglomerate has arbitrarily been classified as hard and very hard on a basis comparable to that used for monzonite. Approximately 15 percent of total pit production is now mined in this formation.



Larger churn drills handle 6,000-lb strings of tools

Big Churn Drills Efficient

Churn drills have been used in all formations and "hardness" areas of the pit. Two sizes are in use. The larger drills will handle up to 6000 lb of tools and have proven more efficient than the smaller rigs in all types of ground and with all bit sizes.

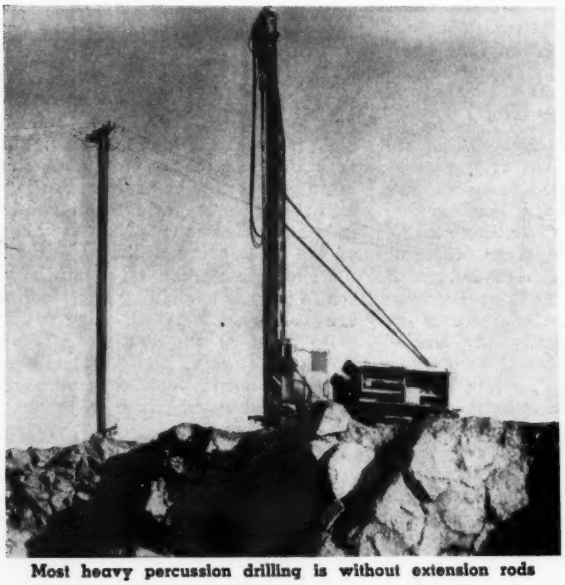
The large drills were originally equipped with 12-in. bits and tools having a combined weight of approximately 5000 lb. The stroke was set at 40 in. It has since been found that increasing the weight of tools up to the capacity of the machine will increase the rate of penetration and over-all efficiency per shift in all hardness areas. Likewise, increasing the length of stroke from 40 in. to 46 in. will increase the rate of penetration in all areas. Within the range of drilling conditions encountered at Ajo, it may be said that for all sizes of bits used, the drilling performance will profit from using the longest stroke and greatest tool weight possible, providing adequate clearance between tools and hole is maintained.

The preferred size of churn drill bit for use in monzonite and rhyolite is now 11¼ in. With this size bit, tool weight can be maintained at 6000 lb. Standard 12-in. pipe is used for collaring these holes, of which 90 percent is recovered if cement is added to the drill sludge while the hole is "spudded-in."

Pump Bailer Works Better

Between the time the holes are first drilled and powder loading operations start, about 40 percent of churn drill holes require cleaning. This work is done either with a churn drill or by a truck mounted rig that handles a mud scow or pump bailer. The pump bailer is a more efficient hole cleaner than the regular dart bailer carried on a churn drill.

Churn drilling efficiencies in fanglomerate have always been low due to the abundance of hard boulders en-



Most heavy percussion drilling is without extension rods

Mast can be tilted as much as 20° from vertical

countered and to the presence of the large fractures which tend to deflect the drill hole and in which the drilling sludge may be lost. As has been previously mentioned, due to the characteristics of this formation, the large diameter churn drill holes are of no particular advantage for blasting; with the closely spaced hole pattern required, it has been found that six-in. holes will hold sufficient powder to break the material. However, six-in. churn drill holes are less efficient than some of the larger sizes due to the relatively low weight obtainable with tools for this size hole and to the large fractures in which a small bit seems to hang up more readily than a larger one. Therefore, when churn drill holes are used, they are preferably drilled with a large machine using a nine-in. bit and as heavy a string of tools as possible.

The average drilling rate per shift for 11¼-in. bits with 46-in. stroke and 6000 lb of tools in medium monzonite has been 55 ft.

Heavy Percussion Drilling

A heavy percussion type drill was first introduced at Ajo in 1951. This is a self-contained unit having electric-powered compressors which furnish air for the drill machine and various air motors. The drill itself is a piston type machine and is mounted on a vertical mast at one end of the rig. Starter rods as long as 40 ft and tungsten carbide bits up to seven-in. diameter can be used.

This type of drill was put into use in fanglomerate where six-in. holes are adequate from the standpoint of blasting and where conditions in general were unfavorable to churn drilling. The use of this equipment has proven successful and five machines are now in use. However, the successful application has required some development in methods and techniques.

Although the drills were originally designed as dry machines and dust collectors are standard equipment, the drills at Ajo have now been converted for wet or "damp" drilling by adding a water tube at the top of each drill and a small pump for controlling the amount of water used. For the type of material being drilled, it has been found that this has several distinct advantages. Where the surface is broken or loose, ample water is used during collaring of the hole to "mud" it. This provides a fairly strong collar which, with the addition of a small length of paper casing at the very top, will usually hold. After solid material has been reached, the water is reduced to a point at which cuttings are blown freely from the hole without sticking, but all dust is suppressed. When this amount of water is maintained, the large fractures that are frequently encountered during drilling are effectively sealed off, whereas with dry drilling it was found that sometimes cuttings from the hole being drilled would not even reach the collar, being blown through cracks into an adjacent hole or falling back into the hole being drilled. Thus, damp drilling has aided in collaring holes, suppressing dust and improving drilling efficiencies.

Drill Shorter Holes

Due to the time required to add and remove extension rods and the difficulty of recovering extension rods when they become stuck in the hole, there is an appreciable difference in the number of feet drilled per shift where the holes are under 40 ft in depth compared to where they are over 40 ft. At Ajo, bank heights in fanglomerate are 33 ft wherever practical, and most heavy percussion drilling can be done without the use of extension rods. Drilling without extension rods also benefits hole cleaning. This is an advantage as about 30 percent of the holes drilled by the heavy percussion drills must be cleaned prior to powder loading.

In addition to drilling in fanglomerate, these drills are used in other formations where closely spaced holes of shallow depth are required and in situations where inclined holes are desirable. The mast can be tilted as much as 20° from the vertical with only minor alterations, or the whole rig can be set up in a tilted position to drill at smaller angles. The drills presently are not equipped for sampling.

The average drilling rate with six-in. bits has been 144 ft per shift in hard fanglomerate. This compares with 36 ft for churn drilling with nine-in. bits.

Bit life for the six-in. tungsten carbide bits has averaged nearly 4000 ft to date. Average gauge loss has been 0.59 in. Bits are sharpened about every 500 ft. The hollow drill rods have an average life of approximately 7500 ft.

Large churn drills, swinging 6000 lb of tools and using 11¼-in. bits, are at present the most efficient rigs for breaking ground at Ajo if the rock is rhyolite, hard monzonite or medium monzonite.

Heavy percussion drills, drilling damp, are the most efficient machines that have been tried for drilling in fanglomerate. They are much more efficient for holes under 40 ft in depth than for deeper holes.

Montour No. 4 Mine

(Continued from page 36)

won turkeys in the Turkey Race sponsored by Pittsburgh Coal Co. To be eligible for a turkey, a miner has to have worked the year without a lost-time accident and the mine must have had a minimum production of 50,000 tons per lost-time accident.

Cooperation Important

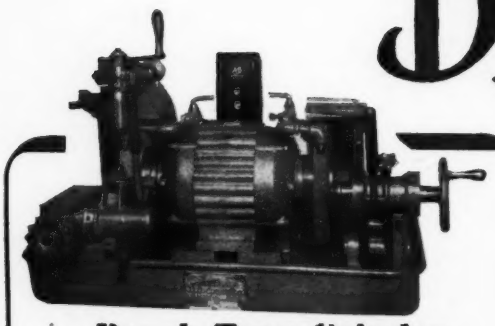
Improvements in production and mining efficiency are a reflection of the cooperation between miner and management. New skills had to be learned by the workers and new ideas mastered by management. Without the full cooperation of all concerned any investment in new equipment would be to no avail. It is interesting to note that the company in its modernization program stuck with conventional equipment rather than going to continuous mining. Of course, conventional equipment has always had the capacity to produce large tonnages. The big job has been to load coal a greater part of the working time.

The achievement of a substantial increase in output at lower cost per unit experienced at Montour No. 4 proves once more what careful planning, attention to detail and close cooperation between labor and management can do with conventional mining equipment.

Timber is used in pillar work and in isolated cases in entries

"Blount"

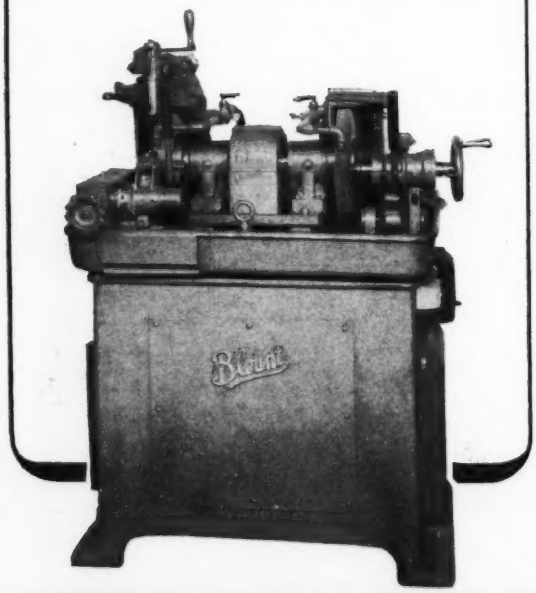
DETACHABLE BIT GRINDERS



Bench Type Grinder
(Pan dimensions—35" x 26" x 4½")

BENCH and FLOOR TYPES
Electric, Air or Gasoline Driven

Floor Type Grinder
(Over-all height—55", floor space—36" x 31")



Let Blount Grinders solve your bit grinding problems. Whatever type of detachable bits you're using, Blount can furnish just the right equipment to keep your bits in shape—for improved drilling performance and longer life.

Full information on request—no obligation. All you have to do is to advise the type and make of bits to be sharpened, and the type of drive desired.

- Grinders furnished with 2 HP 12" or 3 HP 14" diameter wheels, 1¼" arbor.
- Equipped with Timken tapered roller bearings.
- Furnished complete with fluting, gauging and form wheel dresser fixtures of improved design (wear and water resistant).
- Equipped with 1¼" wide regular form and gauging wheels for grinding regular steel bits.
- Special type wheels furnished for grinding carbide tipped bits.
- Coolant tank and circulating pump furnished with floor type grinders.
- Starting switch with motor protection.

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Heated screen cloth remains open . . . you get *more* tonnage through the screen and better separation.

Operating records prove that heated wire cloth screens last up to three times longer than non-heated cloth, because they do not have to be pounded free of blinded material. For the same reason, you save man-hours too. These lower costs increase your profits.

The *Thermo-Deck* unit can be applied to Allis-Chalmers screens in the field. See your nearby Allis-Chalmers representative for complete details. Or write Allis-Chalmers, Milwaukee 1, Wis., for Bulletin 07B7812.

A-4272

POWER ON, *Thermo-Deck* heating unit keeps screen cloth clear on vibrating screen handling fine, moist material.

POWER OFF, troublesome blinding occurs. This view shows same screen as above, with *Thermo-Deck* unit shut off.

For Intermittent Feed... ADD A *STA-KLEEN* DECK

If feed is intermittent, fine material may bake on the wire cloth during interruptions in feed. Heat which ordinarily is absorbed by moist material increases the temperature of the wire cloth sufficiently to cause any fine material to bake on. The addition of a *Sta-Kleen* deck effectively prevents this. Bouncing rubber balls between the screen cloth and a ball retaining deck clear the cloth of baked-on particles.

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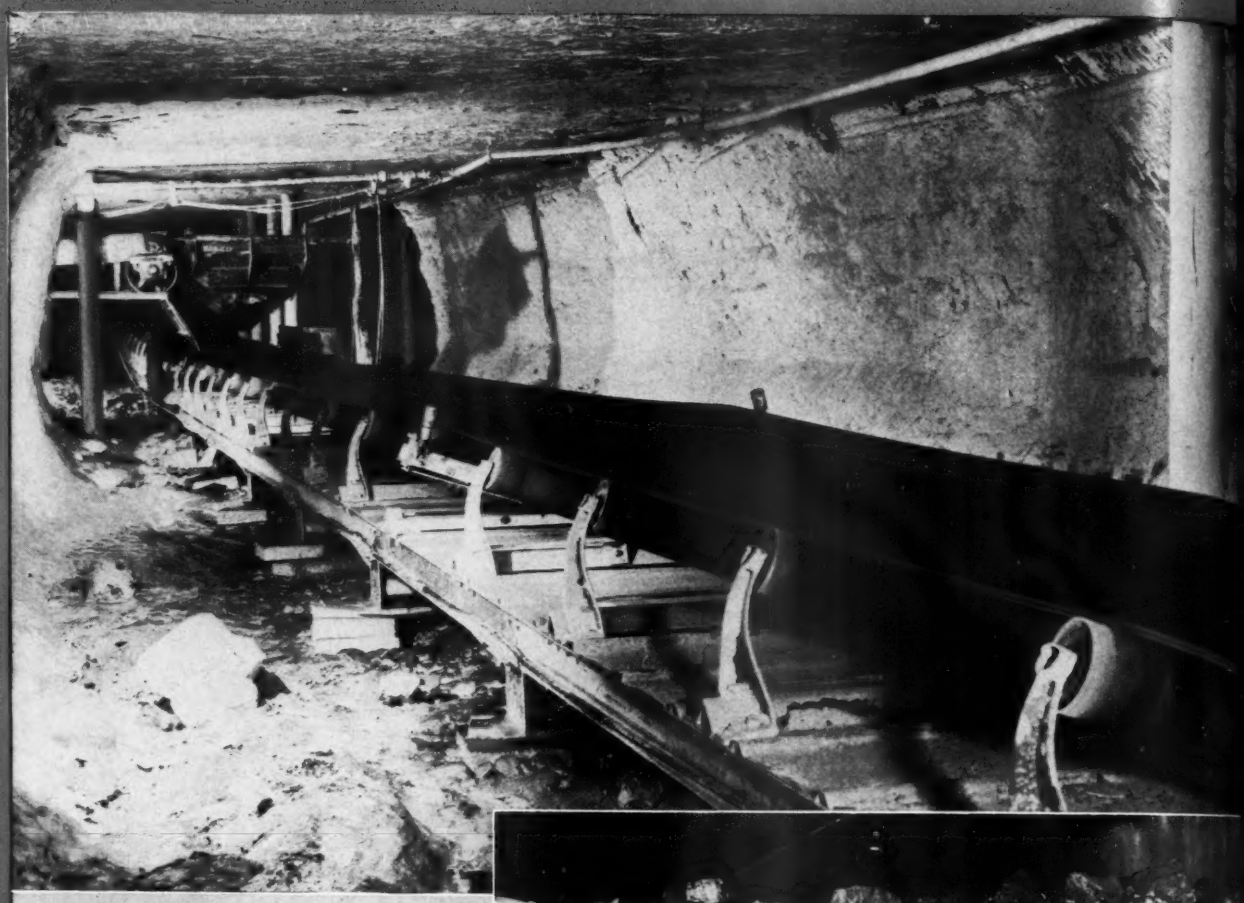
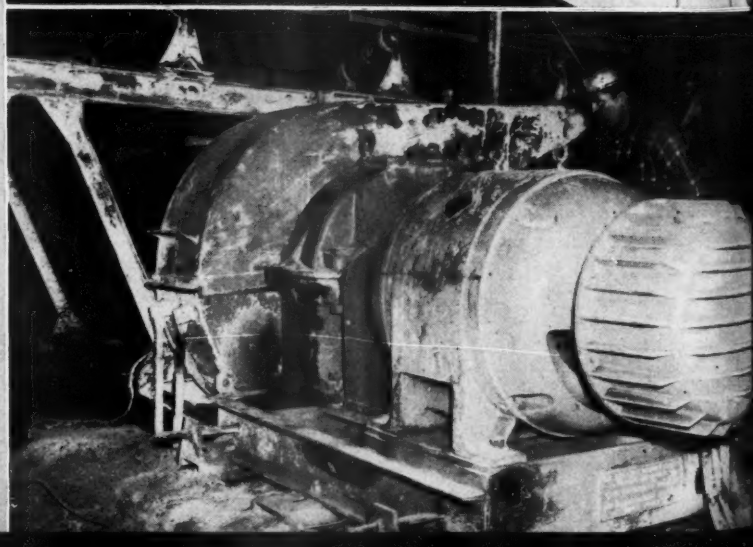


FACTS and FIGURES ON THIS ALL-BELT JOB

36" panel belts carry the coal from working areas and deposit it on 42" sub-main haulage belts running from either side (five each way) to a 48" main haulage belt for delivery to a storage hopper. The 42" belts are projected to 9000' from the main belt, with a drive unit every 4000'. Coal flows at 500 fpm on the 42" belt, and at 600 fpm on the 48" belt.

All 42" and 48" conveyors are of Joy knockdown type, with heavy duty idlers, drives and take-ups, and with impact idlers where required to absorb shock of large lump transfer. A 48" transfer belt, with Joy impact idlers throughout, takes the discharge from each 42" belt, reducing wear and impact damage on the 48" main belt. A unique 60" Joy shuttle feeder belt serves the storage hopper, and a 48" feeder takes the coal from the hopper to a 48" steel cable slope belt for delivery out of the mine.

Although rated at 1000 TPH on this job, installed in a highly modern mid-western operation, a Merrick weightometer has shown up to 2400 TPH going over the 48" belts.



Anything from a single belt to an all-belt conveying system like the job illustrated at left

...Let Joy Engineer it

SPECIAL FEATURES GIVE YOU EXTRA ADVANTAGES

The Joy line includes a complete selection of belt conveyors to meet any underground operating condition for gathering, main line or slope haulage—and any requirement above ground as well. They're built in any required width from 26″ to 48″, and in a wide range of styles and sizes. All Joy Belt Conveyors feature refinements of design and materials which insure rugged, heavy-duty construction, and provide field-proven dependability and low maintenance.

KNOCKDOWN DESIGN MAKES ADVANCING FAST AND EASY

Strong, pan-type intermediate sections are produced in 8′, 9′, 10′ or 12′ lengths, with idler spacings to suit the job and with 4″, 5″ or 6″ dia. rolls. They're built to secure the maximum ratio of strength to weight, and the component parts bolt together to form extremely rigid, dependable units.

Joy "knockdown-type" conveyor sections are highly appealing features to most operators. They provide the easy portability so essential in low coal, and in any seam, they greatly reduce the labor and down-time losses of conveyor advances or change-overs.

HEAVY DUTY IDLERS, DRIVES, ETC.

Joy idler rolls are regularly supplied either with sealed-for-life ball bearings, requiring no attention, or with grease-type roller bearings as desired. Both styles are built for severe service, but in addition, we have developed a new series of heavy-duty belt idlers which offer the ultimate in high-tonnage, high-speed transport of bulk material, with long service life and low repair costs. With a 48″ belt, the new idlers are rated to carry 1300 tons per hour at a belt speed of 600 feet per minute, and actual performance has reached 2400 TPH.

Investigate the benefits of Joy Heavy Duty Idlers on your belt haulage jobs. And remember, Joy is the only manufacturer of both tandem-pulley conveyor drives and direct-connected, totally-enclosed single pulley drives. We have the experience and the equipment to answer your conveyor problems *best* . . . let us help you.

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During this period H & P has designed and built coal preparation facilities of all types to meet the needs of the coal industry.

To find new answers to old problems the Research and Development Department of Heyl & Patterson is constantly searching for new products, new methods and new improvements to meet the coal industry's need for higher production at lower cost.

Whether your preparation requirements concern a complete new plant, the modernization of your old plant, recovery of fine coal, closing your water circulating system, or replacing equipment to increase production . . . it will pay you to place your problem in the experienced hands of Heyl & Patterson to find the most practical answer to meet your needs.

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Coal Crushers
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1954 Coal Convention

PRESENT trends in coal mine output have caused increased emphasis on efficient operation. In the never ending fight to cut production costs, wise men of the coal industry are making plans to attend the coal convention of the American Mining Congress in Cincinnati May 3-5 to hear the latest advances in technology discussed. Much additional information will be gained from personal contact with others in the industry.

Headed by Chairman Edward G. Fox, the Program Committee has done an outstanding job in providing sessions and convention papers that will be of timely value. Pertinent and diversified subjects will be presented, as an examination of the advance program will show. Luncheon speakers will discuss subjects of broad national interest to the entire industry.

An incidental but important part of any convention, the entertainment program is also outstanding. The famous Coal Miners Party will be held Monday night at Coney Island, Cincinnati's famous amusement park. Following a buffet supper, there will be an evening of music, dancing and entertainment. Then too there are the attractions of the great playground. Baseball will be in the spot-

(Continued on page 49)

Edward G. Fox
Chairman, Program Committee

Advance Program

MONDAY—MAY 3

10:00 am—Opening Session

What's Ahead for Coal?—A consideration of industrial trends and their probable impact on coal demand which may bring serious problems to the industry and the Nation.

Eugene Ayres, Technical Assistant to Vice-President, Gulf Research and Development Co.

The Federal Coal Mine Safety Board of Review—A panel discussion by Board Members, explaining the objectives and procedure designed to further coal mine safety.

Edward Steidle, Chairman, Dean Emeritus, Pennsylvania State University.

Edwin R. Price, Board Member, Manager Coal Properties (Retired), Inland Steel Co.

Charles R. Ferguson, Board Member, Director Safety Division, United Mine Workers.

Troy L. Back, Executive Secretary

John S. Forsythe, General Counsel.

12:15 pm—Luncheon

Guest Speaker to be Announced.

2:15 pm—Roof Support Session

Rotary Drilling in Sand Rock for Roof Bolting—Covers drilling equipment, nature of the roof strata, performance records, speed of drilling, bit wear and methods of dust control.

J. K. Berry, Production Engineer, Clinchfield Coal Corp.

Pneumatic Drilling for Roof Bolting—A description of a central compressor station and the underground pipe line system for compressed air distribution to the working faces for roof drilling.

Martin Valeri, Assistant to General Superintendent, and **M. M. Fitzwater,** Chief Engineer, Buckeye Coal Co.

Yielding Steel Ring Support of Squeezing Coal Tunnel—An account of a ring assembly in a successful installation where conventional timbering had failed, submitting material and labor costs.

C. S. Kuebler, Assistant Mining Engineer, Lehigh Navigation Coal Co.

Pillar Extraction—Methods, Results, Recovery—Stresses the need to reduce coal losses underground and gives accounts of several pillaring methods showing the recovery procedure.

George L. Judy, Vice-President, Consolidation Coal Co. (W. Va.)

2:15 pm—Strip Mining Session

Truck Haulage Problems—Engines, Tires, Roads—Discusses in detail three phases of haulage, outlining the problems to be solved for raising the efficiency of strip production.

Andrew Hyslop, Chief Engineer, Hanna Coal Co.

The Coal Recovery Auger—A Modern Mining Tool—Two speakers describe operations in their fields showing the application of auger mining in strip pit highwalls under different seam and overburden conditions.

Kenneth O. Shaner, Assistant Vice-President, Mech Mining Co.

D. A. Zegeer, Assistant to President, Consolidation Coal Co.

Anthracite Stripping in Burning Areas—An account of an unusual operation, covering the extent of the burning areas, blasting method, disposal of overburden and recovering the coal.

John W. Davies, Blasting Engineer, Shen-Penn Production Co.

Monday Evening—Coal Miners Party

TUESDAY, MAY 4

10:00 am—Mechanical Mining Session

Face Preparation Methods—Speakers from two fields, describe the face operations with several types of cutting and drilling equipment to meet different seam conditions.

D. C. Howe, Mines Industrial Engineer, Vesta-Shannopin Coal Division, Jones & Laughlin Steel Corp.

Robert Yourston, Resident Engineer, Union Pacific Coal Co.

Complete Mechanization in a 4 Ft Seam—Covers the face cycle and the auxiliary panel operations giving special attention to two types of service haulage—shuttle cars and portable conveyors.

F. F. Stewart, Superintendent, Jewell Ridge Coal Corp.

Efficiency of Large vs. Small Crews for Mechanical Mining—Several viewpoints are presented, as to the factors which determine the number of men recommended for a section crew.

Henry W. Bauer, Division Manager, West Virginia Coal & Coke Corp.

J. Craggs, Field Superintendent, Operations, Peabody Coal Co.

G. S. Jenkins, President, Clarkson Manufacturing Co.

10:00 am—Coal Preparation Session

Effect of Future Markets on Coal Preparation—A forecast of competitive trends in fuel utilization and a discussion of their probable effect on future sizing and cleaning specifications.

J. B. Morrow, Mining Engineer, Alford, Morrow & Associates.

Coal Preparation at Midwest Radiant Co.—A description of a modern coal preparation plant, showing the flow sheet and giving a complete account of the cleaning processes.

I. V. Curtis, Chief Engineer, Midwest Radiant Co.

Heavy Media Coal Cleaning—Speakers from two fields will show the part which heavy media plays in coal preparation as applied to large and small capacity plants.

A. E. Sadler, Assistant Chief Engineer, and **J. W. Forman,** Preparation Engineer, Pocahontas Fuel Co., Inc.

D. C. Snyder, Vice-President, Mt. Hope Coal Co.

Development in Feldspar Jigging—An appraisal of feldspar jigging practices in Europe in relation to its possible application for fine coal cleaning in the United States.

Dr. H. F. Yancey, Chief, Fuels-Technology Division, Region II, U. S. Bureau of Mines.

12:15 pm—Luncheon

Address: "Atomic Energy and Its Industrial Applications"

Walker Cisler, President, The Detroit Edison Co.

2:15 pm—Haulage Session

Underground Belt Conveyor Maintenance—Describes correct installation methods and protective devices to prevent belt wear, to guard against accidents, and to reduce the fire hazard.

R. U. Jackson, Manager Mine Conveyor Sales, Hewitt-Robins Incorporated.

Shuttle Car Haulage to Mine Cars—Details the service haulage operation from the face to mine car trips, showing types of equipment, method of mine car loading and trip handling.

Thurman C. Harris, Jr., Assistant Engineer, Ingle Coal Corp.

Shuttle Car Belt Loading in Thin Seams—Gives experiences with different methods of belt conveyor loading in a range of seam heights, and explains the advantages of their present system.

C. H. Williams, Chief Engineer, Red Jacket Coal Corp.

Extensible Belt Conveyor for Continuous Mining—Describes the conveyor operation in conventional and continuous mining and discusses further experiments in prospect.

W. J. Shields, Chief Mining Engineer, Rochester & Pittsburgh Coal Co.

2:15 pm—Strip Mining Session

Bigger Returns from Larger Stripping Equipment—Gives a case history of modernizing a large dragline and discusses possibilities of design improvement in other high cost production equipment for surface and underground operations.

Thomas M. Ware, Vice-President, Engineering Division, International Minerals & Chemical Corp.

Recent Information on Blasting Vibrations—Shows the results of tests and experiments to determine the effect on surface structures of ground waves and sound waves from heavy blasting.

Jules E. Jenkins, Vibration Measurement Engineers.

Strip Mine Haulage Roads—Describes haulage operations with large capacity trucks in the Western Kentucky field, including road construction and dust prevention.

R. H. Uhl, Mining Engineer, W. G. Duncan Coal Co.

Tuesday Evening—Baseball Night

WEDNESDAY—MAY 5

10:00 am—Maintenance and Power Session

Maintenance Organization and Practices at Hudson Coal Co.—A description of the maintenance organization, including the crews and type of work done in the surface shops, underground shops and the production sections.

Donald Smith, Superintendent of Shops, Hudson Coal Co.

Underground Installation of High Voltage Cables—An operator and a manufacturer will present a comprehensive review of recommended practices showing types of cables, installation and operating methods, including protective devices.

John A. Dunn, Electrical Engineer, Island Creek Coal Co.

T. R. Weichel, Mine Electrical Engineer, Hazard Insulated Wire Works Division of The Okonite Co.

Mine Illumination—The BCR Underground Experiments—An overall account of an underground lighting installation that has been successfully applied in a mechanical loading panel.

Gerald von Stroh, Director, Mining Development Committee, Bituminous Coal Research, Inc.

10:00 am—Coal Preparation Session

Reject Disposal by Truck, Pumping, and Belt Conveying—Cites a typical problem involving the disposal of 100 tph of reject by the pumping method and gives comparative costs between pumping, conveying and trucking.

W. A. Weimer, Chief Engineer, Northern Illinois Coal Corp.

Increased Coal Recovery by Reduction of Washery Wastes—Describes methods used to increase the recovery of coal and to improve the quality of fine sizes prepared for market.

Richard Mullins, Chief Chemist, Ayrshire Collieries Corp.

Recent Developments in Eliminating Stream Pollution—A review of the present status of progress in the Ohio River drainage basin, including what is being done by the coal industry.

Henry F. Hebley, Research Consultant, Pittsburgh Consolidation Coal Co.

2:00 pm—Continuous Mining Session

Continuous Mining Operations—A symposium covering typical operations with the several types of continuous machines in entry development, room mining and pillar recovery.

Goodman Miner:

J. W. MacDonald, Vice-President, Engineering, Old Ben Coal Corp.

Jeffrey Colmol:

E. M. Pace, Mine Superintendent, Inland Steel Co.

Joy Continuous Miner:

Richard Graham, Superintendent, Saginaw Dock & Terminal Co.

Konnerth Miner:

Ralph C. Beerbower, Jr., Mine Superintendent, Coal Division, U. S. Steel Corp.

Lee-Norse Miner:

C. B. Tillson, Jr., Superintendent, Crucible Steel Co. of America.

Marietta Miner:

F. R. Zachar, General Superintendent, Christopher Coal Co.

Two Years' Experience in Longface Mining—Two speakers will report on results in different fields and seam conditions, operating European-designed equipment.

W. D. Hawley, Division Manager, Eastern Gas & Fuel Associates.

Richard T. Todhunter, Barnes & Tucker Co.

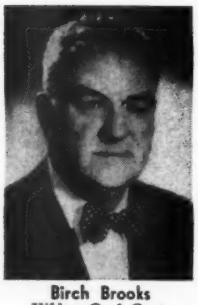
Wednesday Night—Annual Banquet

Members—Program Committee

R. Laird Auchmuty
Consulting Engineer

Henry Barnhart
Baldwin-Lima-Hamilton Corp.

J. W. Broadway
Bell & Zoller Coal Co.



Birch Brooks
Viking Coal Corp.

E. G. Brown
U. S. Rubber Co.

R. J. Craig
Rochester & Pittsburgh Coal Co.

R. M. Dickey
Bucyrus-Erie Co.

A. F. Dobbrodt
Carboloy Division General Electric Co.

K. L. Fitts
Off-Highway Sales Div. Mack Motor Truck Corp.

J. Robert Fletcher
J. H. Fletcher & Co.

M. H. Forester
Pittsburgh Consolidation Coal Co.

C. A. Gibbons
Susquehanna Collieries Division M. A. Hanna Co.

R. K. Gottshall
Atlas Powder Co.

J. L. Hamilton
Island Creek Coal Co.

W. D. Hamilton
Saginaw Rock & Terminal Co.

H. John Harper
Eastern Gas & Fuel Associates

George R. Higinbotham
Consolidation Coal Co. (W. Va.)

James D. Ireland
Peters Creek Coal Co.

G. S. Jenkins
Clarkson Mfg. Co.

Frank Kolbe
United Electric Coal Cos.

1954 Convention

(Continued from page 46)

light Tuesday night, when the Cincinnati Reds and New York Giants will play a night game. A special Mining Congress section has been arranged for this event. On Wednesday evening the annual banquet will wind up the convention. It will feature fine food, good music, rare entertainment—and no speeches.

In addition, a special program of daytime entertainment has been arranged for the ladies to keep them occupied while the men are attending the meetings. All in all, the convention promises to be a memorable affair.

Entertainment ticket order forms and advance registration cards have already been mailed out. Tickets for the entertainment functions will be sent by registered mail in mid-April. Baseball tickets at $2.00 and $2.25 for box seats and $2.00 for reserved grandstand are to be purchased directly from the Cincinnati Baseball Club Co., 307 Vine St., Cincinnati 2, Ohio.

Room reservations, as in the past, may be made through the Cincinnati Convention and Visitors Bureau, Inc., Union Central Bldg., Cincinnati, Ohio. Write, wire or phone now to assure the best available accommodations.

Program Committee *(Continued)*

(Photos not available)

O. M. Evans
Midwest Radiant Corp.

W. W. Everett
Glen Alden Coal Co.

Kenneth Snarr
Miners Coal Co.

Merle C. Kelce
Sinclair Coal Co.

Harry LaViers
South-East Coal Co.

J. W. MacDonald
Old Ben Coal Corp.

E. R. McMillan
Northwestern Improvement Co.

C. B. Peck
Anaconda Wire & Cable Co.

Davis Read
Consulting Engineer

W. L. Reich
Reich Bros. Mfg. Co.

G. M. Rigg
Weirton Coal Co.

Wm. M. Ritter
Red Jacket Coal Corp.

J. T. Ryan, Jr.
Mine Safety Appliances Co.

J. H. Sanford
Ohio Brass Co.

Chester Sensenich
Irwin Foundry & Mine Car Co.

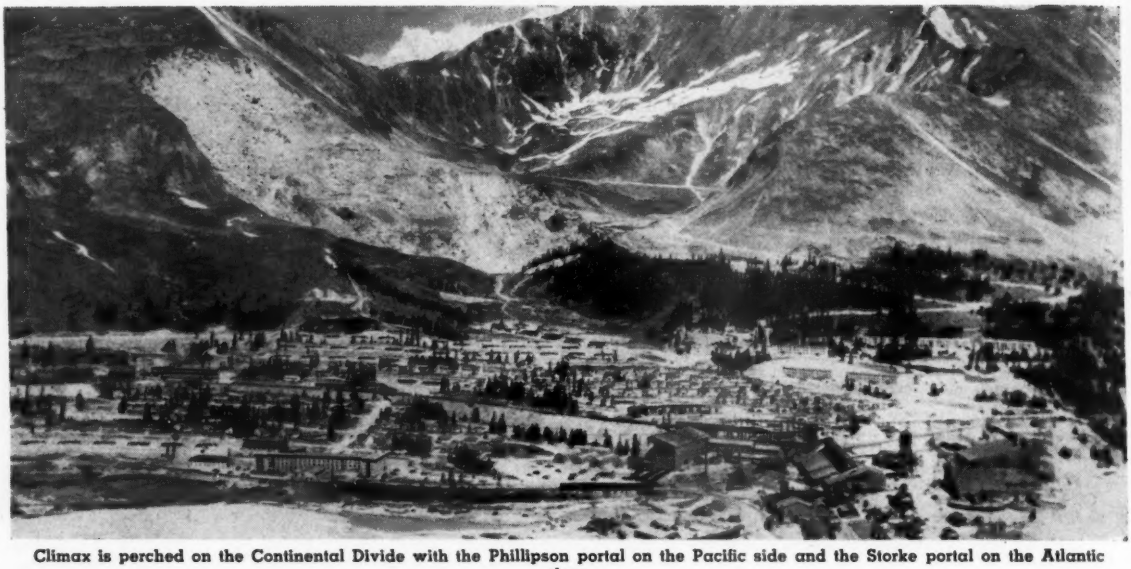
Frank G. Smith
Sunday Creek Coal Co.

J. B. Taggart
Wise Coal & Coke Co.

J. F. Trotter
Trotter Coal Co.

C. W. Waterman, Jr.
McNally-Pittsburg Mfg. Corp.

W. L. Wearly
Jay Mfg. Co.



Climax is perched on the Continental Divide with the Phillipson portal on the Pacific side and the Storke portal on the Atlantic slope

Communications on the Climax Haulage System

Radio-Telephones Help Increase Output With Safety, Improve Teamwork and Morale of Employes

By EDWIN J. EISENACH

Assistant Mine Superintendent
Climax Molybdenum Co.

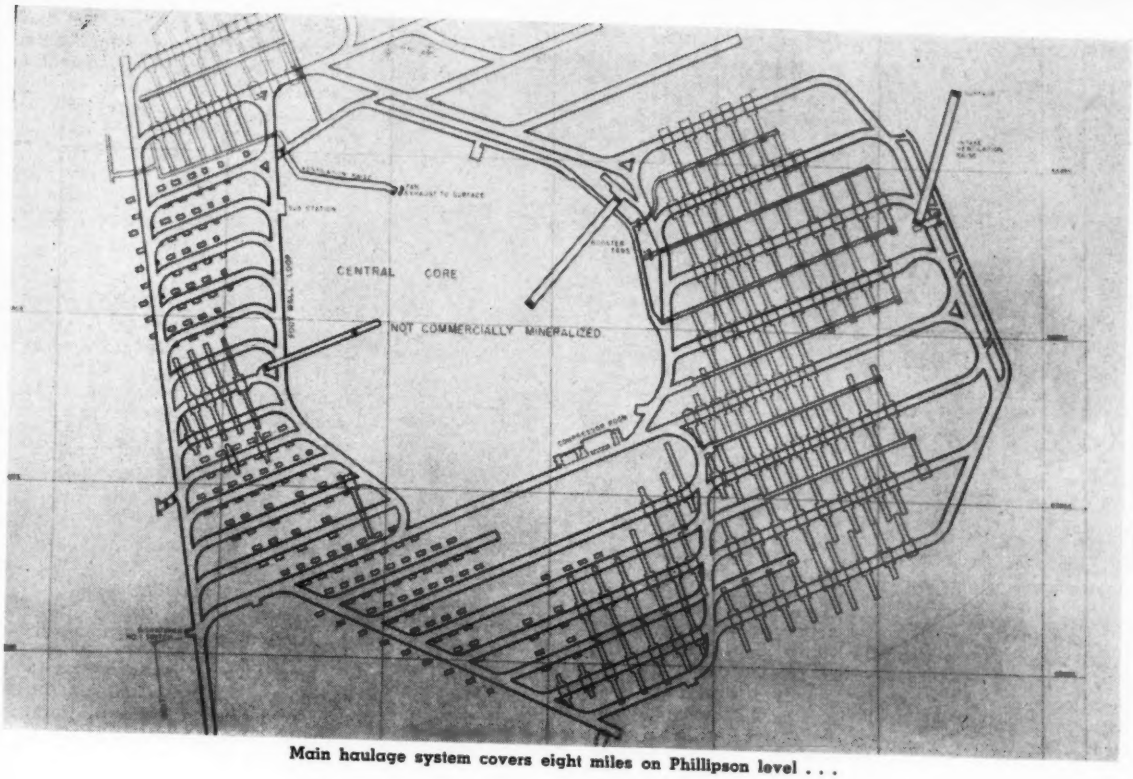
MINING operations of the Climax Molybdenum Co. are situated near Fremont Pass at an altitude of 11,320 ft, 13 miles northeast of Leadville, Colo. Two mining levels are operated for the production of ore which is processed through the crushing and milling plants to obtain a high grade molybdenum sulfide concentrate. The Phillipson Level has been in production since 1932; the Storke Level began production in February, 1953. The portal of the Phillipson Level is on the Pacific Watershed of the Continental Divide, and the Storke Level portal is on the Atlantic Watershed, with both adits leading to the same ore body at elevations 300 ft apart. The present plant capacity is about 25,000 tpd.

In recent years the Government's molybdenum stock-piling and defense program has necessitated an expanded production schedule at Climax. This has materially increased our haulage problems. The mine haulage communications system was installed when output was only 13,600 tpd. Then, as now, a means of improving safety and efficiency was important to our operation. The original installation consisted of nine carrier type "Femco Trolleyphones"; at the present time there are 22 units in operation, covering a haulage system of eight miles on the Phillipson Level and four and one-half miles on the new Storke Level. This number includes four units mounted on service and supply trains.

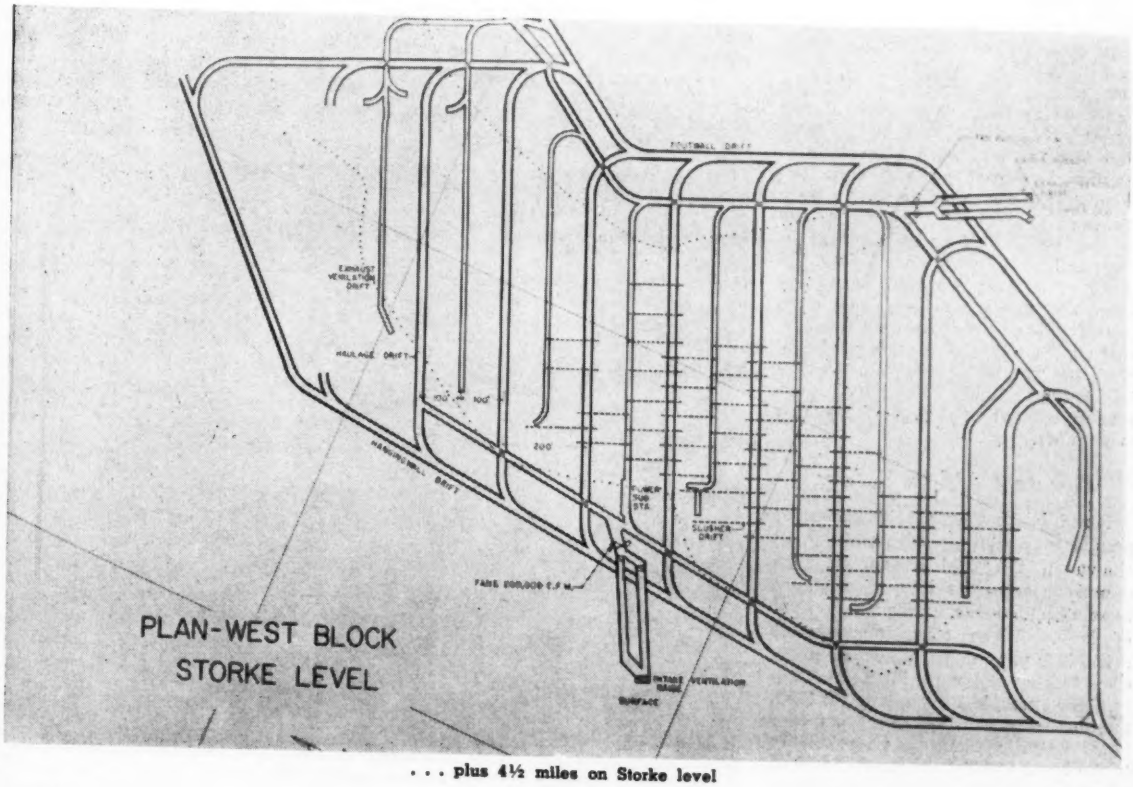
Our estimates indicate that a production gain of at least ten percent is realized with the addition of radio-telephones. The team work and the morale of the employes are also greatly improved by this added convenience. The men take a great interest in knowing what fellow workmen are doing on the other side of the mine. These "Trolleyphones" permit accurate, quick communications as to the status of production and other mine operations. The two working levels are operated on different frequencies as a safeguard against misinterpretation or mixing of orders. The only direct means of communication between the two levels is by telephone.

Because a loading drift may have as many as fourteen loading points from which to load ore, it is often advantageous to use more than one train at a time in a drift. Normally, from two to five loading areas are being drawn simultaneously on each operating level during each working shift. This draw is controlled by a centralized dispatching system on each level, each operating four to eight trains. To obtain a maximum tonnage it is important that the dispatcher know where the trains are, how fast they are being loaded, when they are loaded, and when they are dumped, because all areas vary in the time required for a complete cycle. This is caused by the differences in the nature of the ore, length of haul to and from the loading areas, mechanical or electrical failures, and unpredictable situations.

A train made up of twenty 230-cu ft side dump cars will carry an average pay load of 165 tons of ore. One hundred and forty trains per 24 hr represent an average haul over distances varying from three to five miles.



Main haulage system covers eight miles on Phillipson level . . .



. . . plus 4½ miles on Storke level

Plug-in components are easily replaced and defective or damaged part sent to factory for repair

Unpredictable delays are remedied faster with the aid of the radio. Maintenance men from the electrical, mechanical, timbering, track and supply crews are easily contacted by radio from train to train, or by way of the dispatcher. The dispatcher has telephone communication to all shops and other points of the operation. The ever-wanted supervisor can always be reached when needed, and when it is necessary to obtain clearance from a train that is blocking a main haulage way, it can be done in a very short time, usually before the train needing clearance arrives. The work of the supervisor is reduced, and he has more time to direct and work with his men. Having improved contact with the train crews, he can accordingly pace the work progress of the blasting and loading crews. If no such means of communication were available, the large mine area involved would require that the supervisors keep moving rapidly and continuously to allow contact to all the working places. With the "trolley phones" close working contact is maintained and more efficient utilization of supervisory time is possible.

Greatest Aid to Safety

Possibly the greatest improvement resulting from the radio units can be shown in the field of safety. On numerous occasions injured employes have benefited through quick arrival of help. When other emergencies arise, it is possible to obtain the proper authority and material immediately. For example, on January 16, 1952, two men were involved in a premature blast when a hang-up unexpectedly broke loose and detonated about 40 lb of 45 percent semi-gelatin dynamite. This explosive had been placed in the overhanging ore to be shot, and was detonated by a sudden and unexpected movement of the rock mass. It is not uncommon for hang-ups to move, but detonation of the explosive from this cause is unique. The two men were within 20 ft of the shot, and both suffered severe shock, concussion and asphyxiation. A third man ran to the locomotive in the drift and reported the accident by radio; within a few minutes an oxygen mask and first aid equipment were brought to the scene of the accident. The injured men were taken to the hospital, which had been alerted by telephone. While taking the patients to the hospital, the dispatcher was able to direct the movement of the trains and keep the main haulage way clear. The doctor stated that one of the injured employes would have had far more trouble if it had not been for the immediate action resulting from the prompt dispatching of a rescue locomotive. This accident occurred within three weeks after our first installation of "trolley-phones."

Many times it has been necessary to use an extra locomotive at the rear of a train to assist in going through heavy snow, to straighten out wrecks, or to help on steep or slick track. If it is necessary for a train to stop because of derailments or train ahead, the motorman can tell any train following him to be prepared to stop, thus preventing a collision. Since loaded trains have a gross weight of 340 tons and travel between 10 and 15 mph, it is vital they be warned of an impending stop. With the aid of the radio, two or more locomotives can work in unison.

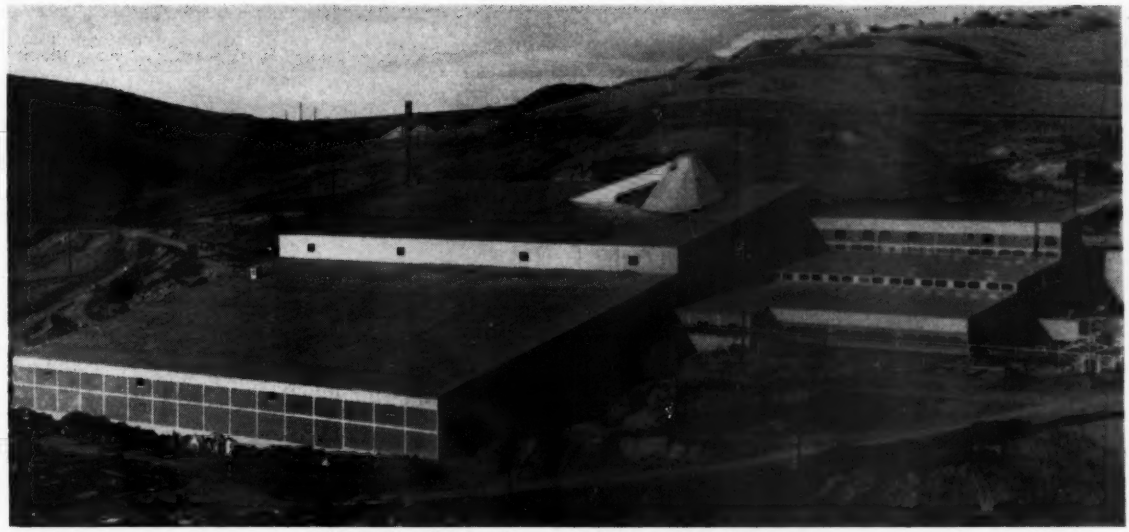
Radio Helps Teamwork

These direct communication units have proved their worth in many ways from the time that they were installed. The prevention of one serious injury or collision more than justifies the cost of the units involved.

Hazards from radio frequency energy have been of great concern as the result of a premature explosion reported to have occurred during oil field seismograph work while the men were using mobile radio units. Actually, this is the only accident with electric blasting caps to date that can

(Continued on page 80)

Perforated plate protects speaker from blasting shock



The Carlton Mill has been operating for almost three years

FluoSolids Roasting at The New Carlton Mill

Golden Cycle Is Bettering Target Figures With Bulk Roast of Flotation Concentrates Followed by Cyanidation

By T. B. COUNSELMAN
Manager, FluoSolids Sales
The Dorr Company

THE famous Golden Cycle Mill was for many years at Colorado Springs. Ore from the various mines in the Cripple Creek District was shipped by rail to the mill, crushed, roasted as raw ore to get rid of the tellurium, and cyanided. Roasting was done in eight Edwards roasters using coal as fuel.

When the Colorado Springs concentrating plant was scrapped and the Carlton Mill built in the district between Cripple Creek and Victor, the flowsheet called for roasting a bulk flotation concentrate instead of roasting the crude ore. This bulk flotation concentrate would contain about 22 percent of sulphur, and it was desired that this provide the fuel for roasting. Also, it was desired to avoid the expense of drying the flotation concentrate before roasting. Both of these factors were important. Importing fuel, either coal or oil, into the district from Colorado Springs, either to furnish fuel for roasting or for drying the feed, would be prohibitive, now that the railroad was torn up; and everything would have to move by truck.

Careful tests at Westport, Conn., by The Dorr Co. proved that even when feeding the concentrate in the form of a slurry at 80 percent solids, the roast would be autogenous if the sulphur were maintained at 20 percent or above. Also, cyanidation results on the calcine were excellent. Therefore a FluoSolids System for the roasting of bulk flotation concentrate was installed at the Carlton Mill of the Golden Cycle Corp.

The general scheme of treatment is that the ore (custom ore), after suitable crushing and grinding, is subjected to bulk flotation. This concentrate is reground and recleaned. The recleaned concentrate goes to a thickener from which the underflow is pumped to a storage agitator and blending tank. From here the concentrates are pumped to the filter. The filter cake is discharged to the repulper and goes from there to a small slurry agitator ahead of the Moyno Pump, which pumps the feed at the desired rate into the FluoSolids Reactor.

The bulk of the calcine overflows the Reactor to a quench tank. Solids entrained with the gas are caught in two stages of 42-in. Western Precipitation Cyclones and one two-tube 24-in. multiclone, all connected in series. When it was found that significant values got by the three stages of cyclones, a part of the Cottrell unit which had been in use at Colorado Springs was installed. The over-all dust recovery is now considered excellent.

All of these several calcines are quenched in water and then go to conventional CCD cyanidation, with the customary Merrill-Crowe precipitation. Residues from the standard cyanidation join the tailing from the bulk flotation and go to the very interesting and successful cyanidation using carbon precipitation. The great advantage is that this is carried out in a series of agitators and no thickeners and no filters are used.

Physical Makeup of System

The FluoSolids System *per se* consists of the repulping agitator to repulp filter cake to the desired moisture; the slurry agitator; the Moyno Pump to feed slurry at a controlled rate from the slurry agitator into the reactor; and the reactor itself with its appurtenances, the quench tanks, the blower, and the instruments. Pulp density at about 77 to 80 percent solids is maintained in the agitator, density being estimated by the judgment of the operator. A continuous density control instrument

was furnished for the installation; but its use has been discontinued because it was found to be more convenient, quicker, and sufficiently accurate to judge density by eye. (The automatic density control instrument has worked well on several other installations.)

The reactor, which is lined with insulating brick and refractory brick, is 14 ft in diameter inside the brickwork. The bottom is a constriction plate with openings at about 12-in. centers, fitted with tuyeres so constructed as to minimize sifting of calcine into the windbox. This windbox is below the constriction plate, and air is delivered to this windbox from a turbine type blower.

How It Works

When solids are fluidized they behave like a liquid, seeking their own level, overflowing weirs, exerting hydrostatic pressure, and so on. Consequently the bulk of the solids report as reactor overflow. Lesser amounts are caught in the two stages of cyclones, the multiclone, and the Cottrell. A typical distribution of these products is as follows:

Reactor Overflow	60 percent of calcine
First Cyclone	30 percent of calcine
Second Cyclone	4 percent of calcine
Multiclone	2 percent of calcine
Cottrell	4 percent of calcine
Total	100 percent

The gas vented to atmosphere after the Cottrell is practically clean except when the Cottrell is being shaken.

The gas analysis is 14 percent SO_2, with two percent combined SO_3 and CO_2 and less than one percent oxygen.

All of the calcine products are wetted in quench tanks of special design and pumped to cyanidation.

The 14-ft diameter FluoSolids Reactor has a nominal roasting capacity of 65 tons of flotation concentrate at 20 percent sulphur per 24 hr. It has operated at rates as high as 75 tpd. At times, when the total available quantity of calcine is low, the reactor is operated at capacity rates of 50 tpd. It is also possible to operate for only part of a day, say one or two shifts, shutting down the rest of the time.

	Black Roast	Chocolate Roast	Red Roast
Gold Recovery, percent	88.10	91.44	94.70
CaO consumption, lb/ton	7.22	6.82	8.61
NaCN consumption, lb/ton	4.58	3.44	2.58
Excess air used, percent	2.0	4.5	11.6
Fluidizing air, cfm	1100	1100	1100
Feed, percent solids	79.1	79.5	80.0
Spray Water for temp. control, gpm	1.5	1.3	1.9
Stack Gas, percent SO_2		14.9	12.2
percent $SO_2 + CO_2$		1.9	2.1
percent O_2		0.8	2.1
Feed, Au	7.76	8.55	9.09
S	22.4	22.9	24.3
Fe	21.4	22.4	23.1
Insol.	45.6	44.7	41.3
Calcine, Au	9.53	8.93	10.59
Sulphide S	0.51	0.55	0.17

In the above tests true conditions for a red roast were not established, hence the apparent discrepancy between text and data.

Easy to Start or Stop

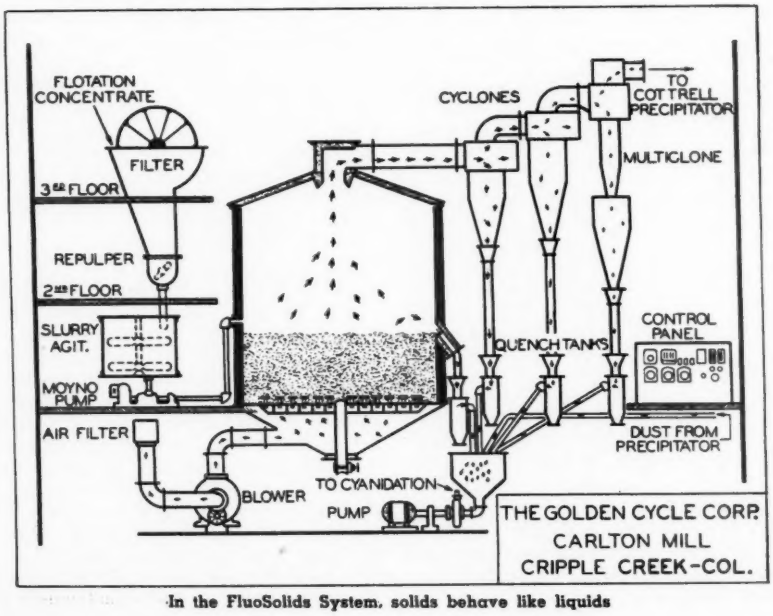
Shut-downs are very simple. The operator merely stops the air and the feed. The bed of material at about 1100° to 1200°F loses heat so slowly that when ready to start again after a one or two shift shut-down, the operator simply starts the blower and feed. The sulphur in the pyrite ignites immediately, and the reactor is "on stream" again in a few minutes. The reactor has been down as long as 36 hr and started again in this manner without additional heat and without difficulty. When roasting pyrite concentrate, for example, for sulphuric acid manufacture, at a bed temperature of about 1650°F, shut-downs of 77 hr have been recorded with similarly easy start-ups. This characteristic of FluoSolids Reactors is of immeasurable value for week-end shut-downs, or for running repairs or maintenance in other parts of the plant.

The Golden Cycle Reactor at a feed rate of 50 tpd uses 1100 cfm of air, which is introduced into the windbox at approximately 2½ psi pressure. Air is distributed uniformly up through the constriction plate, as described above. The bed of material in the reactor is four ft six in. deep.

The slurry feeding arrangement is shown in the flowsheet. Thickened flotation concentrate is filtered, then repulped to the desired moisture. This is now judged entirely by eye and is intended to be the thickest pumpable slurry. This slurry is pumped from the slurry agitator into the reactor by a Moyno pump, running at about 90 rpm and equipped with a variable speed drive. Water for controlling the temperature of the bed in the reactor is added at the discharge side of the Moyno pump and enters the reactor with the slurry feed.

New Moyno pump parts last about two months. The same rotor and stator are kept together, the stator being of rubber. When worn, the rotor is built up with ordinary welding rod, then ground to fit tightly its companion stator. Rebuilt parts last about one month, and the rotor can be built up three times before it has to be discarded.

The feed gun is a piece of black iron pipe, flattened somewhat at the end, and lasts four to six weeks. It is



In the FluoSolids System, solids behave like liquids

cheap to replace. A small amount of air is bled into the feed gun with the slurry. When shutting down, this air is left on. This cools the feed gun and prevents build-up of baked slurry on the inside of the pipe.

Chocolate Calcine Preferred

With a given setting of air, the rate of slurry feed is adjusted so as to give a chocolate colored calcine. The following tabulation shows the results of a series of three tests in which adjustments were deliberately made to give a black, a chocolate, and a red roast. A greater excess of air is ordinarily used for a red roast, up to 50 percent. With that much excess air, and a red roast, gold recovery is generally lower than with a chocolate roast.

It has been found, both at Golden Cycle and at other gold roasting operations in Canada, that a chocolate colored calcine gives the best compromise between recovery of gold and reagent consumption. Therefore a chocolate colored roast, determined by eye, is usually used. It should be noted that the very best results are obtained by a two-stage roast in which the arsenic (or telluride) is distilled off in a reducing atmosphere, with a deficiency of air; and the hot calcine, still containing sulphur, is reroasted with an excess of air to a red calcine. The black color is magnetic oxide of iron; the red color is hematite; and the chocolate color, a mixture of the two.

Achieved Objective

The objective, when the Carlton Mill was built, was to attain a tailing carrying 0.02 oz gold over-all or less. The average of one month's figures for the FluoSolids roasting and cyanidation circuit showed:

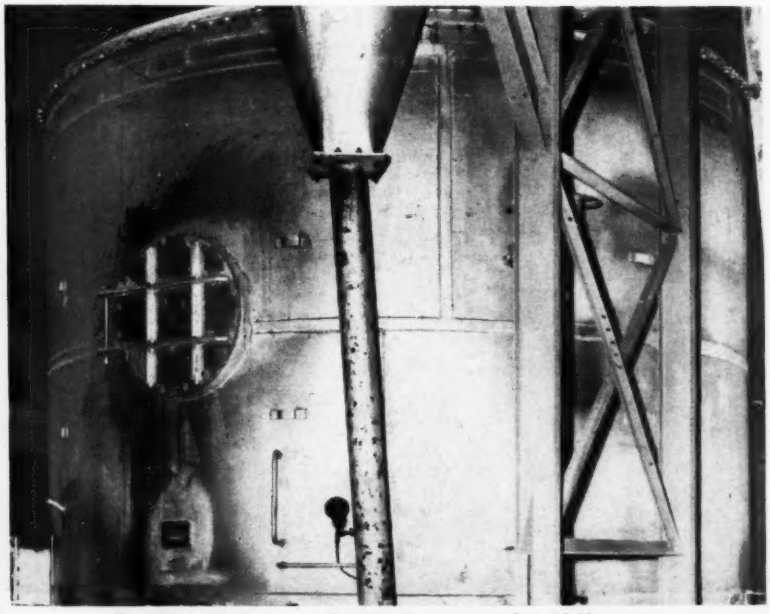
Sulphur in roaster feed	22.91 percent
Calcine heads, oz gold	4.45
Calcine tailing, oz gold	0.14
Gold Recovery	96.85 percent

Since the tailing from the cyanidation-carbon deposition circuit, treating flotation tailing, averages under 0.010 oz gold, the over-all tailing objective of 0.02 oz has been fully attained.

Roasting costs for a year's operation, in which period the Carlton Mill treated about 150,000 tons of crude ore, and on the assumption that the concentration ratio was 20 to 1 (meaning 7500 tons roasted), amounted to $3.40 per ton roasted. A considerably greater tonnage could have been roasted at no increase in total cost and with, therefore, a lower per ton cost.

The reactor was started in April of 1951. It was shut down from September of 1951 until January, 1952, for the installation of the Cottrell. The reactor was not cooled down again for inspection until March, 1953. At that time the bed was pulled down far enough to inspect part of the tuyeres and those inspected appeared to be in good shape.

Much of the operation was one or two shifts, or something between the two, depending on the quantity of concentrate available. There is no evidence of any repair of refractories being necessary. Maintenance has mostly been auxiliary equipment such as the Moyno pump, the agitators, etc.



Roasting costs for a year's operation amounted to $3.40 per ton

Fine Dust a Problem

The principal difficulty encountered has been collection of the very fine calcine in the dust cleaning equipment. The screen analysis of the feed to the reactor, during the red roast run, was as follows:

Mesh	Microns	%Cum+
35	417	0.1
48	295	0.5
65	208	3.1
100	147	11.7
150	104	24.6
200	74	36.0
	60	44.0
	40	58.0
	30	66.0
	20	76.0
	10	87.2
	8	89.7
	5	93.8

The collection efficiency of the several stages of cyclones is as follows:

First cyclone, Western Precipitation type	78%
First two cyclones, Western Precipitation type	86%
First two Western Precipitation type, one Multiclone	90.3%

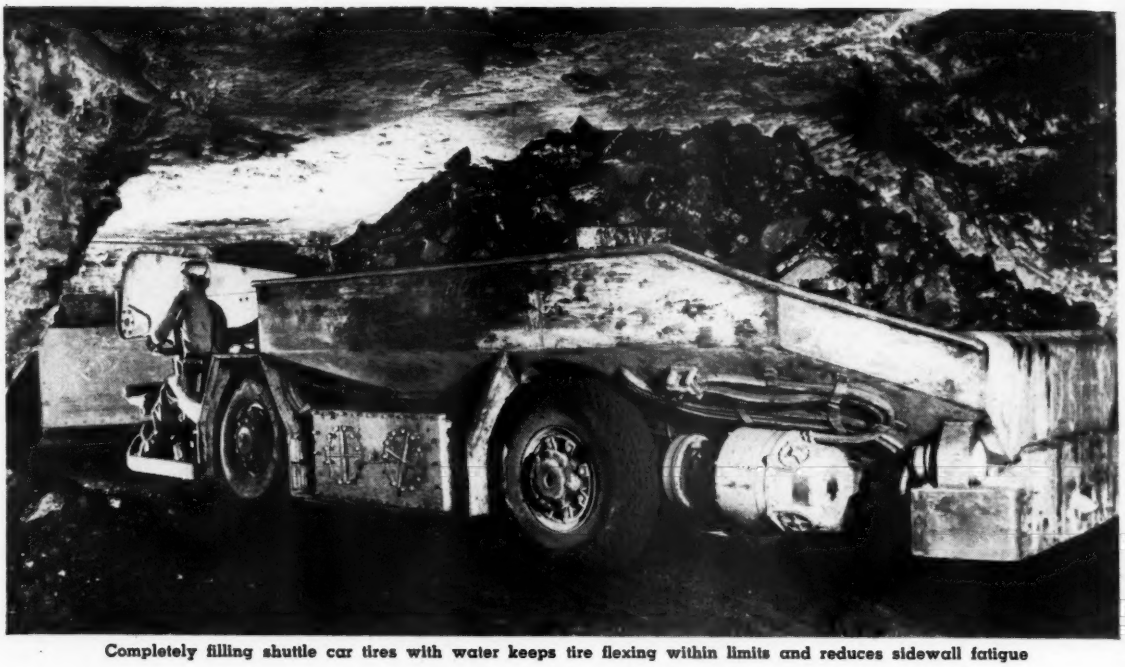
The gold analyses of the several calcines in the red roast run were as follows:

Feed	9.09 oz. Au per ton
Reactor Overflow	5.26
First Cyclone	16.46
Second Cyclone	19.22
Multiclone	17.35

Install Cottrell

Because of the high value of the finer calcine and because of the collection efficiencies of the several cyclones, it seemed desirable further to increase recovery by installing the Cottrell which the company owned and which had been used at Colorado Springs. One-quarter of this old Cottrell was all that was needed, and it was therefore installed. An increased collection of 4.6 percent of the total calcine, or 9.3 percent of the carryover, was recovered by this Cottrell; and it analysed 7.6 oz gold. There is probably some dust still getting past the Cottrell, but it cannot be seen in the plume of steam from the stack, except when the Cottrell is shaken.

As is always the case with steel stacks, there is considerable corrosion above the point where the temperature reaches the dew point. The SO_2 gas, plus water vapor, plus iron oxide as a catalyst, forms weak sulphuric acid. A steel stack, for any type of roaster, lasts about two years. There is a tile stack at one installation in Canada which seems to be standing up well. Golden Cycle is reported planning on a stainless steel stack which should be satisfactory.



Completely filling shuttle car tires with water keeps tire flexing within limits and reduces sidewall fatigue

Liquid Ballast for Mining Equipment Tires*

Longer Life and Lower Maintenance Costs Can Be Had by Substituting Water for Air

USE of liquid ballast in tires dates back to the early days of pneumatic tires on farm tractors, but use of such ballast on mining equipment tires has come about comparatively recently.

Mining equipment must be limited in size, particularly height, and this entails tire size restrictions and load problems which are different from other operations. High inflation pressures are recommended for mine tires and such pressures are very difficult to maintain.

During the past few years, mine operators have used 100 percent water filled tires on underground mining equipment with great success. The practice is quite simple as no anti-freeze solution is required—freezing temperatures are not commonly found in underground mines.

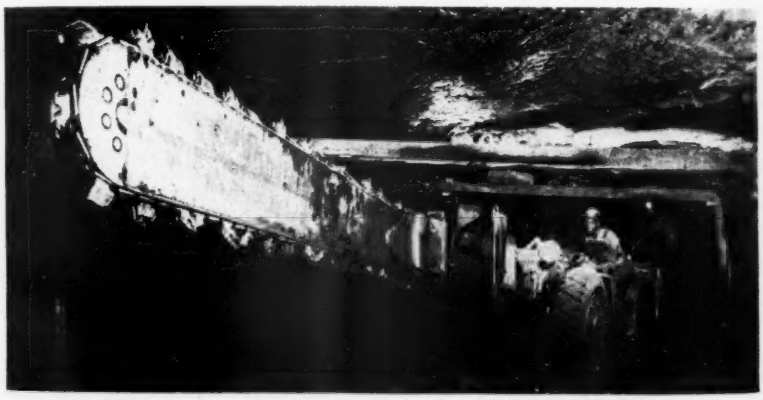
Use of liquid ballast has eliminated the frequent service necessary in re-inflating tires when air is used and it also has greatly reduced tire failures caused by loss of inflation pressure. In addition, water filling eliminates the hazards of dust caused by air-inflated tires blowing out.

One of the disadvantages of inflating tires with air is that mine operators must take a compressor below ground or take mine equipment to the surface—both of which are inconvenient and expensive.

Ballast Prolongs Tire Life

It has been found that the use of water is a more satisfactory means of maintaining proper internal pressures in mine tires because it prolongs the life of tires, reduces tire maintenance and lowers operating costs.

Rubber companies and mine equipment manufacturers now recommend that pneumatic tires on such equipment as shuttle cars, cutters and loaders, which operate at speeds of less than five mph, be 100 percent liquid filled.



Tire pressure is maintained more easily in liquid-ballasted tires

* Prepared by the Goodyear Tire & Rubber Co., Automotive Division, at the request of MINING CONGRESS JOURNAL.

Water ballast has a number of advantages over the more common practice of air-inflation and some of these are as follows:

(1) One hundred percent water filling maintains adequate pressure constantly until the tire is worn out or punctured.

(2) In a 100 percent water filled tire, internal pressure varies with the load, giving minimum pressure when the load is light and increased pressure when the load is heavier. This keeps the flexing of the tire within reasonable limits which reduces cord fatigue in the tire sidewalls.

(3) Water filled tires have no seepage such as occurs with air in tubes and no extra time is required for checking tire pressures.

(4) Mine operators report that water filled tires ride and steer better than tires inflated with air. There is less bounce because of the dampening effect of water. Rolling resistance is decreased and this results in less power consumption.

(5) Elimination of air removes the hazard of dust caused by tire blowouts in mines. The spurt of water from a punctured tire cannot be dangerous.

These advantages add up to longer tire life, less loss of production because of tire failures and elimination of inflation equipment and personnel for checking and inflating tires underground. All this means that mine operators can realize lower tire costs and lower equipment service costs.

Over-Inflate New Tires

Recommended water pressure for unused, new mine tires which have a recommended air pressure of 95 to 100 lb is 100 to 110 lb. The tire grows when put in use and the water pressure drops to approximately 70 lb which is desirable for 95 to 100 lb air pressure recommendations.

Pressure in new tires is set high initially to compensate for the pressure drop which occurs when tires stretch and grow after a few miles of service. All tires do this. The pressure which results from this is the desired operating pressure.

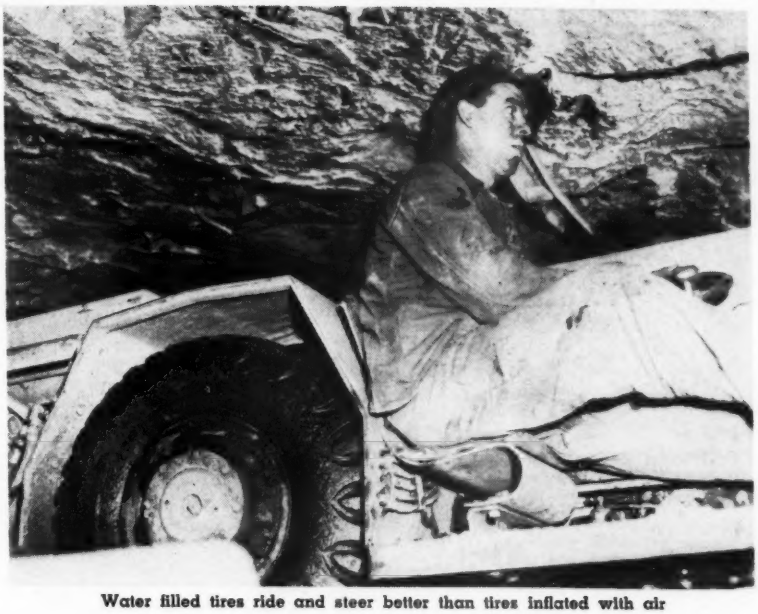
Used mine tires should be filled to a water pressure of 70 lb only.

These hydrostatic pressures should be at *zero loads.*

Special high pressure positive displacement pumps have been developed to evacuate all the air from a tire and to properly fill it with water. This pump has all the necessary attachments to do a complete water filling job on mine tires.

Tires may be filled with water on or off the vehicle, but to eliminate the necessity of moving the pump and water container, the tire and wheel assembly should be removed from the machine. If the tires are filled on the vehicle, all wheels must be jacked-up so that the tires do not touch the ground.

When the tires have been filled 100 percent with water, pressure can be checked with a separate gauge in much the same manner an air filled tire is checked for pressure.



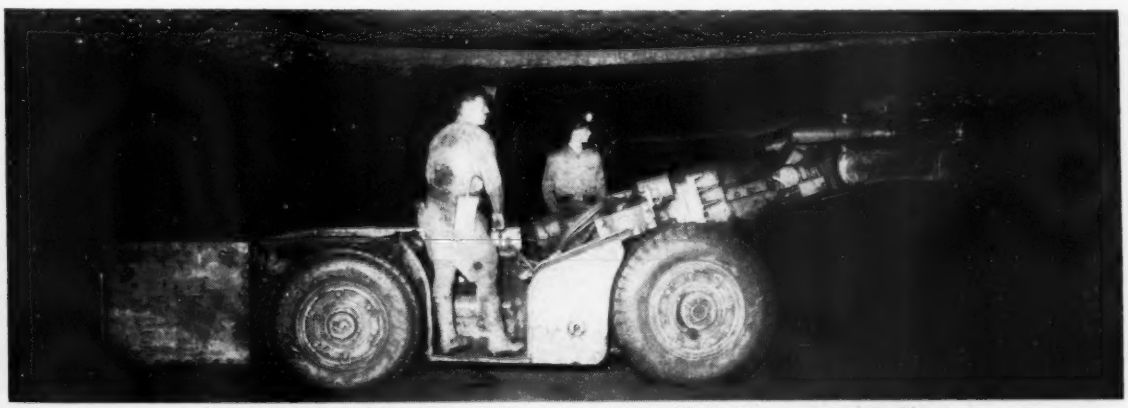
Water filled tires ride and steer better than tires inflated with air

Let Stand 24 Hours

All water filled tires should be allowed to stand at the maximum pressure desired for at least 24 hr and the pressure then re-checked.

Some loss of pressure normally will occur during the 24-hr period because any air trapped between the tube and tire casing will escape. After the pressure has been re-adjusted, the tire is ready to be put into service. Valves may be sealed to eliminate tampering.

The use of water does make the handling of mounted tires somewhat more difficult due to the increased weight. As the size of the tire increases this becomes more noticeable; also, the shock absorbing features of tires are dampened, resulting in an increased transfer of shock to the frame of the vehicle.



Longer tire life and less time spent on maintenance add up to increased production

Service Haulage for Continuous Mining

A Survey of 33 Mining Operations Reveals Several Methods of Transferring Coal from Continuous Mining Machines to Service Haulage Units

By FRANK R. ZACHAR
Subcommittee Chairman

CONTINUOUS mining seems to be the most logical answer for lower coal production costs. One very important phase of continuous operation is transporting the coal from the face machine. In fact, a solution to this problem must be found before the expected tonnages can be produced. The objective of this Subcommittee of the Mechanical Loading Committee is to stimulate effort within the industry toward finding that solution. With the above in mind, this report deals only with methods of taking away coal mined by the continuous machine and does not include any intermediate or main line transportation.

As a basis for the study, the committee has made a survey covering 33 continuous mining operations. Details of these operations, as given in subsequent pages, describe a total of 36 service haulage methods as follows:

16 operations use a pick-up loader behind the continuous machine.

15 operations load directly into surge car.

5 operations load directly into a shuttle car or a chain or belt conveyor.

The majority of the mines reported on have not reached a satisfactory solution for their service haulage, and the committee suggests that a type of equipment is needed that will meet the following specifications:

It must permit the operation of the continuous mining machine with a minimum of delays. It must have sufficient capacity to handle the peak production of the machine. It must suit the seam conditions as to thickness, gradient, floor, roof and drainage. It must permit ventilation check curtains and line brattices. It must handle the sizes of the coal produced and also foreign material such as heaving bottom, roof falls, clay veins, rolls, and rock intrusions. Its adaptability to present, and future mining projections as well as to new continuous machine designs must be considered. And it should reduce present operation, maintenance, capital investment and depreciation costs of haulage equipment.

Northern West Virginia

Mine No. 1 operates in the Sewickley Seam which has an over-all height of 72 in. of fairly soft coal. Roof is good in some areas; other places require timber and at times the draw slate falls as the coal is removed. Roof jacks are set on the advance; jacks, posts and some cribs on the retreat. The floor is a soft fire clay and six in. of bottom coal is left. Shuttle roads usually become rutted. Mining is by the block system, developed with five 19-ft entries on 70-ft centers. Pillars are mined on retreat, with an over-all recovery of 85 to 90 percent. The continuous machine discharges onto the floor. A pick-up loader loads into two or three shuttle cars which haul to a trip of mine cars. The mine management states that some method of continuous haulage is needed and an 80 percent tonnage increase is possible with an improved system.

Mine No. 2 also operates in the Sewickley Seam in 51 in. of fairly hard coal. The roof is a hard shale; 3-in. by

CONDENSED SUMMARY OF CONTINUOUS MINING OPERATIONS

Mine No.	Seam	Height in Inches	Places Mined	Service Haulage
		Northern West Virginia		
1	Sewickley	72	Entries-pillars	Pick-up to shuttle to mine car
2	Sewickley	51	Entries-rooms	Pick-up to shuttle to mine car
3	Pittsburgh	84	Pillars only	Pick-up to shuttle to mine car
4	Pittsburgh	84	Entries only	Pick-up to shuttle to mine car
5	Sewickley	60	Entries only	Pick-up to shuttle to mine car
6	Pittsburgh	86	Entries-pillars	Pick-up to shuttle to mine car
7	Redstone	42-46	Entries only	Pick-up to shuttle to belt
8	Pittsburgh	80	Entries-rooms	Pick-up to shuttle to mine car
		Eastern Ohio & West Virginia Panhandle		
9	Pitts. No. 8	63	Entries-rooms	Surge car to shuttle to mine car
10	Pitts. No. 8	64	Entries-rooms	Surge car to shuttle to mine car
11	Pitts. No. 8	50	Entries-rooms	Pick-up to shuttle to mine car
12	Pitts. No. 8	56	Entries-rooms	Surge car to shuttle to mine car
13	Pitts. No. 8	60	Entries-rooms	Surge car to shuttle to belt
		Western Pennsylvania		
14	Upper Freeport	51	Entries only	Surge car to shuttle to mine car
15	Pittsburgh	80	Entries-pillars	Pick-up to shuttle to mine car
16	Pittsburgh	72	Entries-pillars	Direct to shuttle to mine car
17	Double Freeport	84	Entries only	Pick-up to shuttle to mine car
18	Pittsburgh	74	Rooms-pillars	Surge car to shuttle to mine car
19	Pittsburgh	64	Entries-pillars	Pick-up to shuttle to mine car
20	Pittsburgh	64	Entries-rooms	Surge car to shuttle to mine car
21	Pittsburgh	90	Entries-pillars	Surge car to shuttle to mine car
22	Pittsburgh	84	Entries-pillars	Pick-up to shuttle to mine car
23	Double Freeport	84	Entries-pillars	Pick-up to shuttle to mine car
24	Pittsburgh	84	Entries-pillars	Surge car to shuttle to mine car
		Central Pennsylvania		
25	Kittanning	42	Entries-pillars	Surge car to shuttle to mine car
26	Lower Freeport	46	Entries-pillars	Surge car to shuttle to mine car
27	Lower Freeport	42	Entries-pillars	Direct to shuttle to belt / Pick-up to shuttle to belt
28	Kittanning	40-42	Entries-pillars	Surge car to shuttle to belt
29	Upper Freeport	42	Entries only	Direct to belt / Pick-up to shuttle to belt
		Southern West Virginia		
30	No. 5 Block	47	Entries-rooms	Direct to chain conveyor to belt
		Eastern Kentucky		
31	No. 2 Gas	42	Entries-pillars	Direct to portable conveyor to belt / Surge car to shuttle to belt
		Illinois		
32	No. 6	102	Entries-pillars	Surge car to shuttle to belt
33	No. 6	106	Entries-rooms	Surge car to shuttle to mine car

5-in. planks are set on roof jacks over the machine and moved ahead as it advances. The floor is a semi-hard fire clay making a good roadway for shuttle haulage. Mining is by the block system with two machines driving eight 16-ft entries on 80-ft centers and recovering about 65 percent of the blocks. Each continuous machine discharges onto the floor. A pick-up loader tranfers the coal to a shuttle car, which hauls to mine cars. The loader is necessary for clean-up and to eliminate delays. Management expresses a need for continuous haulage equipment that is not presently available.

Mine No. 3 is in the Pittsburgh Seam with a mining height of 84 in. This operation works on old partially mined area by splitting pillars. About as much slate as coal is loaded. Roof is bad. Five-in. by seven-in. cross bars are set on four-ft centers and reinforced by roof bolts. The floor is soft and must be planked in some places. The continuous machine discharges onto the floor where a conventional loader picks up the coal and puts it in a shuttle car for hauling to mine cars. The loader is necessary to clean up properly and permit maximum operating time. Management feels that the present system is the only one satisfactory for existing conditions and that this area could not be mined with conventional methods.

Mine No. 4 works the Pittsburgh Seam with a mining height of 84 in. The roof is bad and 5-in. by 7-in. cross bars are set on 30-ft centers. All intersections are roof bolted. The floor is soft and must be planked in some places. Entries are being driven to develop the block system but pillar recovery has not yet been started. The continuous machine discharges onto the floor. Coal is then handled with a pick-up loader and one shuttle car hauling to mine cars. A better clean up is obtained with the pick-up loader and more operating time is realized. The management reports that this is the best system known to date.

Mine No. 5 is in the Sewickley Seam with 60 in. of fairly soft coal. The roof is hard shale. Five-in. by seven-in. cross bars are used only at intersections. The floor is fairly hard and makes a good shuttle roadway. At present there are two continuous machines developing a block system, driving eight entries on 70-ft centers. Each continuous machine discharges onto the floor and is served by a pick-up loader and one shuttle car. The management feels this is the best system now available but that some method of conveyor haulage is necessary.

Mine No. 6 operates in the Pittsburgh Seam with an 86-in. mining height of fairly hard coal. There are several binders and sulphur intrusions. Roof is fair and bolts are used for support. The floor is rather soft but suitable for shuttle car roadways. Mining is by the block system with entries on 90-ft centers; pillars are extracted with about a 95 percent area recovery. The continuous machine discharges on the floor where the coal is picked up by a conventional loader and put into one shuttle car which hauls to a mine car trip. A surge car with direct loading was tried but the present pick-up method is reported as more satisfactory.

Mine No. 7 mines the Redstone Seam with 42 to 46 in. of fairly soft coal with numerous clay veins. Floor and roof conditions are very good. Four-in. by six-in. cross bars are set on six-ft centers. Five entries are driven on 60-ft centers. The continuous machine discharges onto the floor and is served by a pick-up loader and two shuttle cars which haul to a belt conveyor. Management feels that the present system is the best devised so far.

Portable belt conveyors offer great possibilities for continuous transportation

Mine No. 8 operates in the Pittsburgh Seam with a mining height of 80 in., leaving 12 in. of top coal for roof support. The floor is soft if wet. Timber lifting jacks are mounted on the miner and cross bars, 5 in. by 7 in. by 14 ft are set on four-ft centers. They are subsequently recovered for re-use. Five panel entries are driven with rooms mined advancing off one side. Pillars are left standing. The continuous machine discharges on the floor. A pick-up loader loads two shuttle cars which haul to a trip of mine cars. The management feels this is the best possible system and has supply handling advantages.

Eastern Ohio and West Virginia Panhandle

Mine No. 9 is in the Pittsburgh No. 8 Seam which has a mining height of 63 in. with a bone parting one to three in. thick in the middle. A 12-in. draw slate requires extensive timbering and 60-lb rail cross bars are set on four-ft centers. Floor is a semi-hard fire clay, making good roadways unless water is present. Two room entries are driven with rooms on 24-ft centers leaving an eight-ft rib. Area recovery is 63 percent. The continuous machine discharges into a surge car which loads a shuttle car that hauls to a trip of mine cars. Management feels that the present system is the best one available but expresses a need for the development of a more efficient transportation method.

Mine No. 10 mines the Pittsburgh No. 8 Seam with a mining height of 64 to 68 in. Roof is bad; a 12-in. draw slate requires 5-in. by 7-in. cross bars on three-ft centers. Floor is soft with frequent rolls. Two room entries are driven with rooms on 24-ft centers leaving an eight-ft rib. Area recovery is 65 percent. The continuous machine discharges into a surge car which loads a shuttle car that transports to the mine car trip. The management feels that the present system is best one available because of numerous timbering delays.

Mine No. 11 operates in the Pittsburgh No. 8 Seam with a mining height of 50 in. The roof is bad. A 12-in. draw slate is supported by 3-in. by 12-in. planking on 24-in. centers. A fire clay floor makes a fair haulageway when dry. Two room entries are driven with rooms on 24-ft centers leaving an eight-ft rib. Area recovery is 60 percent. The continuous machine discharges onto the floor with a pick-up loader and shuttle car handling the coal to a trip of mine cars. Mine management reports this is the best system tried and meets their requirements.

Mine No. 12 is in the Pittsburgh No. 8 Seam and mines a height of 56 in.

A 12-in. draw slate requires extensive timbering and 60-lb rail crossbars are set on four-ft centers. The floor is fire clay which makes a good haulage way, except when wet. Two room entries are driven with rooms on 24-ft centers leaving an eight-ft rib in place. Area recovery is 60 percent. The continuous machine discharges into a surge car which loads shuttles that transport to the mine car trips. Mine management reports that no better system is known to date.

Mine No. 13 mines the Pittsburgh No. 8 Seam with a mining height of 60 in. of hard coal. Heavy sulphur intrusions make cutting difficult. A 12-in. draw slate is held with 60-lb rail cross bars set on four-ft. centers. Floors are semi-hard fire clay which makes good haulage road except when wet. Two room entries are driven with rooms on 24-ft centers, 250 to 300 ft deep, leaving an eight-ft rib in place. Area recovery is 63 percent. The continuous machine discharges into a surge car which loads a shuttle car that hauls to an entry belt. Management reports that no better system is known to date.

Western Pennsylvania

Mine No. 14 is in the Upper Freeport Seam which has a height of 51 in. There are two bone binders and the top six in. is bone coal. The roof is a laminated sand stone requiring 5-in. by 7-in. cross bars on five-ft centers. At times steel rails are necessary. The floor makes a good haulageway when dry. The continuous machine is driving seven entries and discharges directly into a surge car with one shuttle transporting coal to the mine car trip. The management reports that this is the best method they have found, if the haulage distances are kept to a minimum.

Mine No. 15 operates in the Pittsburgh Seam which has a height of 80 in. The roof is bad, requiring six-in. round cross bars on four-ft centers. Bolts are set after the continuous machine has advanced and the cross bars are then recovered. The floor makes a good haulage way, except when wet. Mining is by the block system. Blocks are split when retreating and area recovery is 90 percent. The continuous machine discharges onto the floor where the coal is picked up by a conventional loader and carried by shuttle cars to the mine car trip. Shuttle travel is kept to less than 500 ft. Mine management reports that in its experience, this is the best method to date.

Mine No. 16 mines the Pittsburgh Seam with a height of 72 in. Top is good, no draw slate is present and cross bars are set on four-ft centers. The floor is a hard limestone and fire clay. Mining is by the block system with entries and cross cuts on 100-ft centers. Blocks are retreated on a flat rib line. The continuous machine loads directly into shuttle cars which transport to the mine car trip. The car loading point is moved up every 100 ft and the management reports that with track haulage this system is satisfactory.

Mine No. 17 operates in the double Freeport Seam which has a height of 84 in., occasionally with hard clay veins. Roof conditions are good and cross bars are set on six-ft centers. The mine floor makes a good haulage way when dry but is bad when wet. The present operation is confined to driving main entries. One continuous machine discharges onto floor. A pick-up loader puts the coal into a shuttle car which hauls to mine cars. A second continuous machine loads directly into a shuttle car.

Mine No. 18 is in the Pittsburgh Seam which has a height of 74 in. with sulphur intrusions. Draw slate is loaded out with the coal. Extensive timbering is required and 5-in. by 7-in. cross bars on four-ft centers are used where conditions are normal. At times 7-in. by 9-in. bars are spaced as required. Mining is by the block system. Entries are developed with track equipment and the rooms and pillars are retreated with continuous mining. The continuous machine discharges into a surge car which loads a shuttle that transports to the mine car trip. Mine management reports that this system is efficient but does not meet the capacity of the machine when shuttle car hauls are greater than 300 ft.

Mine No. 19 is in Pittsburgh Seam which has a height of 64 in. Draw slate is removed as the seam is mined. Roof supports are six-in. round cross bars on four-ft centers. The floor is a hard fire clay. Mining is by the block system developed with five entries; blocks are recovered by open-end pillaring. The continuous machine discharges onto the mine floor with a conventional loader putting the coal into a shuttle car for transfer to a 10-ton mine car. The management reports that this is best and most economical method devised to date.

Mine No. 20 is in the Pittsburgh Seam where the height is 64 in. A draw slate from one to five in. thick is held on alternating wood and steel cross bars on 2½-ft centers. The floor is hard when dry. Two room entries are driven with rooms on 26-ft centers leaving 10 to 12-ft ribs between. The continuous miner discharges directly into a surge car which in turn loads a shuttle that transports the coal to the mine car trip. Mine management reports that this is apparently the best system for local conditions.

Mine No. 21 operates in the Pittsburgh Seam where it is 90 in. high. Roof is fair. A 12-in. draw slate is held by leaving head coal and timbering with 4-in. by 6-in. cross bars on four-ft centers. A fire clay floor makes a good roadway. Mining is by the block system, with open-end pillar extraction. There is a 95 percent recovery. The continuous machine discharges into a surge car which loads a shuttle that transports the coal to a mine car trip. Management reports that this is the best system it has found to date.

Mine No. 22 mines the Pittsburgh Seam with a mining height of 84 in. The seam is multi-bedded with "bearing-in-bands," sulphur balls and clay veins. Roof conditions are generally good with sand stone in certain areas. Floor is hard clay which softens when exposed to air and water. Mining is with the block system developed by six entries. Pillars are extracted by a 15-ft split, leaving a 10-ft fender which is subsequently recovered. Two continuous machines are operated. Each discharges onto the mine floor where a pick-up loader puts the coal into shuttle cars which transport it to mine car trips. The pick-up loader gives better clean-up and increases machine operating time. The present transportation system is considered efficient for existing conditions.

Mine No. 23 operates in the double Freeport Seam which has a height of 84 in. including a 10-in. bone parting. Roof conditions are generally good. Five-in. by seven-in. cross bars are set on six-ft centers. A fire clay floor makes good roadway. Mining is by the block system; the pillars are recovered retreating, by splits. A fender is left next to the gob line, but is subsequently removed. Area recovery is 95 percent. The continuous machine discharges onto the mine floor. A pick-up loader transfers the coal to a shuttle for transport to the mine car. The management reports this system is best suited for local conditions and available equipment. It is adequate for short hauls and with delays necessary for timbering.

Mine No. 24 works the Pittsburgh Seam with an 84-in. mining height. Head coal is left for roof support with cross bars on four-ft centers. Floor is soft with many rolls. Mining is by the block system with 14-ft entries on 100-ft centers. Pillars are extracted open end with an area recovery of 92 percent. The continuous machine discharges into a surge car which loads a shuttle car that travels to the mine car loading point. Present short hauls make this system acceptable. Mine management feels that equipment and practices to make the other auxiliary operations continuous are needed before the transportation system becomes the bottleneck.

Central Pennsylvania

Mine No. 25 operates in the Lower Kittanning Seam which has a height of 42 in., with six to ten in. of bone at the top. The hard shale roof is variable, some areas require only posts

for support while others use roof pinning with channel cross bars. Floor is hard fire clay and roadways generally are good. At present the room and pillar system is used with an area recovery of about 86 percent, but experiments with the block system are under way. The continuous machine discharges into a surge car with one shuttle transporting to the belt loading point. This system is believed to be the best. Roof falls make continuous conveyor transportation impracticable, and the seam height does not permit use of pick-up loader. However, management expresses the need for a more continuous system.

Mine No. 26 is in the Lower Freeport Seam which has a height of 46 in. Roof is hard slate and can be held on posts but some cross bars are required. A hard fire clay floor makes good shuttle haulage. Mining is by the block system with cross cuts on 60° angles. Area recovery is about 86 percent. The continuous machine discharges into a surge car which loads a shuttle car for transport to a belt conveyor. Management feels that this system is the best devised to date; it has flexibility and the shuttle cars can handle supplies.

Shuttle cars, at present, are handling the greater part of continuously mined coal

Mine No. 27 works the Lower Freeport Seam with a height of 42 in. The slate roof is supported with posts on four-ft centers, and cross bars where required. The hard fire clay floor generally makes a good roadway. Mining is by the room and pillar system with an area recovery of 85 percent. One continuous machine discharges directly into a shuttle car. Two other machines discharge onto the mine floor and each is served by a pick-up loader and shuttle cars. All shuttle cars load onto a 30-in. belt conveyor. The management is not satisfied but feels that the system is the best devised to date.

Mine No. 28 operates in the Lower Kittanning Seam, mining 40 to 42 in. The coal is soft and top bone is held for roof. Roof is variable and is timbered with six-in. posts on four-ft centers. A fire clay floor makes good roadways. Mining is by the room and pillar system with 36-ft rooms driven on 48-ft centers. Area recovery is 90 percent. A continuous machine discharges into a surge car which in turn loads a shuttle that travels to the belt loading point. Mine management reports that the present system is the only one found that works satisfactorily for efficiency and maximum production, but expresses need for continuous haulage equipment.

Mine No. 29 is in the Upper Freeport Seam with an over-all height of 42-in. Good sand stone and slate roof is timbered with one row of posts four ft from the rib. The fire clay floor makes a good haulageway when dry. Present mining is confined to entry development. The continuous machine discharges directly onto an extensible belt when driving the belt entry. In the other headings the machine discharges coal onto the floor where a conventional loader picks it up and loads into shuttle cars. The shuttle cars dump into a surge car at the belt loading point. This system is strictly experimental.

Southern West Virginia

Mine No. 30 is in the Kittanning or No. 5 Block which has a mining height of 47 in. Bone top with draw slate above is supported by posts on four-ft centers. The bottom laminated coal is easily broken up. Three panel entries are driven with a belt conveyor in the center heading. Mining is by the block system with rooms 28 ft wide on 35-ft centers. Pillars are not extracted. The continuous machine mines a 28-ft room width by advancing 15 ft wide and then taking a 13-ft slab after the room is driven up. The continuous machine discharges directly onto a chain conveyor laid in the room which transports to the entry belt. The chain conveyor has replaced shuttle cars, eliminating expensive roof support and making maintenance economies possible.

Eastern Kentucky

Mine No. 31 operates in the No. 2 Gas Seam with an average height of 42 in. Roof is soft shale; five or six bolts are installed at the face after each six-ft advance. The floor is hard fire clay making a good roadway when dry, but very bad when wet. Mining is by the block system with 16-ft entries on 60-ft centers and cross cuts on 60° angles. Pillars are mined retreating with an area recovery of about 93 percent. Four continuous machines are operated. Two are served by surge cars and shuttle cars which travel to a 30-in. belt. Two other machines are served by portable belt conveyors, in 22 sections, which transport to the belt. Mine management reports that production is 20 percent higher where the portable conveyors are used but that improvements in design are needed to reduce maintenance.

Illinois

Mine No. 32 mines the No. 6 Seam with a height of 102 in. of fairly hard coal with some sulphur intrusion, and the characteristic 1½-in. blue shale band 18 in. above the bottom of the seam. Roof is generally good. Bolts with plank cross bars are set as the place advances. The fire clay floor is good when dry. Panel entries are driven in pairs by one machine; one entry is for belt and one for a supply track. Two machines drive rooms and extract pillars in the panel getting an area recovery of 85 percent. Each continuous machine discharges directly into a five-ton surge car which loads a shuttle that transports to a 36-in. belt conveyor which in turn loads a trip of mine cars.

Mine No. 33 is in the No. 6 Coal Seam with a height of 106 in. of hard coal with some intrusions and the characteristic blue band. Roof is generally fair and is supported by posts on four-ft centers. The mine has a fairly hard fire clay floor. Mining is by the room and pillar system with two panel entries and rooms driven off both sides. No pillars are extracted, and area recovery is 52 percent. The continuous machine discharges directly into a seven-ton surge car which loads a seven-ton shuttle car that transports to a mine car trip. Management reports that the present transportation system is the method preferred although experiments with belt conveyors in the panel entries are under consideration.

Approved by Subcommittee
January 20, 1954

FRANK R. ZACHAR,
T. L. AITKEN,
K. E. CAINE,
R. U. JACKSON,
J. B. LONG,
R. E. MURPHY,
C. W. PADGETT,
B. L. WALDRUFF.

Operators Corner

Proper Storage of Fully-Charged Wet Batteries

By K. A. VAUGHAN
Gould-National Batteries, Inc.

THROUGHOUT industry, material handling supervisors, signal engineers and other plant executives occasionally find themselves stocked with a quantity of storage batteries which, for any of several reasons, cannot be put into immediate use. Such batteries can be stored, fully charged, without damage or deterioration if a simple program is put into effect and followed with regularity.

First, store such batteries in a cool, dry room where temperatures will not fall below 60° F or exceed 90° F. Do not stack the crates, but dispose them on the floor so that cells will be accessible for inspection and charging. Naturally, this arrangement will require that narrow aisles be provided for the sake of accessibility.

Tops should be removed from the shipping crates, and all excelsior or other packing material should be cleared away from around the tops of the cells. Once this is done, examine the cells for possible damage in shipment such as cracked jars or spillage. If any damage is apparent, notify the carrier immediately and have the necessary repairs or replacements made without delay.

At 30-day intervals, take hydrometer readings of several cells; if any cell is found to read as low as 1.200 specific gravity, connect the cells in series (negative to positive) and then to a dc source of current where a low rate of charge is available. Connect the positive terminal to the positive lead of the charging source and the negative terminal to the negative lead. Charge at the recommended finishing rate as indicated on the name plate or in the manufacturer's instructions until a constant voltage and specific gravity are obtained for four readings taken at hourly intervals and while the batteries are on charge.

In case the available charging equipment does not develop sufficient voltage to charge the entire battery at once, the battery may be split up into smaller units and each unit charged separately.

TABLE I

Example Hydrometer Reading	Thermometer Reading	Correction	True Sp. Gr.
1.250	87° F	plus 3	1.253
1.210	80° F	plus 1	1.211
1.180	64° F	minus 4	1.176

All specific gravity readings must be corrected for temperature (Table I). Correction of these readings for temperature is based on 77° F, with a correction factor of three points of gravity for each 10° F in acid temperature. Using 77° F as a base, add three points of gravity for each 10° F above base, and subtract three points for each 10° F below.

Measure Belting in Rolls

By CARL P. NACHOD
Vice-President
Nachod & United States Signal Co., Inc.

HAVE you ever wanted to know the length of belting in a roll? To find the figure mathematically requires some doing, but when using the nomographic chart on the left the problem is simple. First you need to find the outside (D) and inside (d) diameters of the roll and the thickness (t) of the belting on any sheet material in the roll. All dimensions should be in inches.

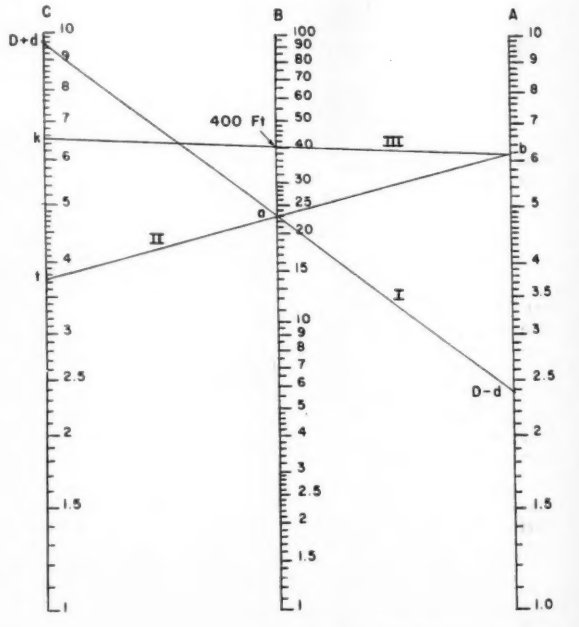
Locate D + d on Scale C and D-d on Scale A. Connect the two points with a line which cuts Scale B at a. Then draw a line from point t on Scale C through point a to intersect Scale A at b. Finally connect b with point k, a constant equal to 0.0655, on Scale C. Where the last line cuts Scale B read length of rolled material in feet.

The example shown assumed a roll of material with an outside diameter of five ft, an inside diameter of three ft and a belt thickness of ⅜ in.

Use of the nomograph in the above manner gives answer to the equation:

$$L = \frac{0.0655\ (D^2-d^2)}{t}$$

A limited number of the charts are available and should you wish to have one, address your request to MINING CONGRESS JOURNAL.



Wheels of GOVERNMENT

As Viewed by HARRY L. MOFFETT of the American Mining Congress

PASSING unnoticed in the face of front page attention to the debate over the Bricker amendment and the McCarthy revelations of Communism in Government is the fact that the 83rd Congress is laboring under one of the greatest legislative loads in history.

Since the first of the year the White House has sent some 200 specific requests for legislative action to Capitol Hill. The action of Congress on these requests will be a main subject of debate in the elections next fall. Behind Congressional scenes and removed from the headlines is feverish activity. Countless Committee hearings are being held on the major features of the President's program and bills are being readied for floor action. To date but few of them have reached Congress for floor debate but in the month ahead a steady stream of legislation will be placed on calendars that will shortly become crowded.

If Congress is to return to the hustings early this summer it is likely that long daily sessions are ahead for the legislators. Chances are that only the most pressing of national issues embodied in the President's recommendations will be acted upon before adjournment. The specific requests thus far advanced do not contain any measures of specific interest to the mining industry.

Fiscal Situation Snarled

Overshadowing all other matters of national concern is the question of how far the present dip in business may go. The President has said that March is the fateful month that will determine whether steps need be taken to counteract a business recession.

Concerned over growing unemployment and doldrums in various segments of industry, Government policy makers have indicated that the Administration will defer its attempts to balance the budget and reduce the national debt if March industrial reports suggest the nation is headed on an economic downswing of substantial proportions. Government pump priming programs coupled with lowering of personal income tax rates are being readied by the Administration against such a finding.

Meanwhile, minority party spokesmen on Capitol Hill are openly declaring that the country is headed for depression and calling for remedies to be promptly applied. Georgia's Senator Walter George has introduced a bill to hike the present personal income tax exemptions from the present $600 per individual to $800 for this year and $1,000 thereafter. Congressional leaders of both parties are seriously discussing the possibility that personal income tax exemptions may be raised this year.

The over-all economic situation likewise may have a strong effect upon Congress' action on appropriation bills. The first of eleven regular appropriations measures, the Treasury-Post Office bill, has been approved by the House after $5.5 million was sliced from it. Economy stalwarts in Congress are using their pruning knives to clip funds measures wherever possible in an attempt to bring about a balanced budget, but the success of these efforts will depend in large part upon what the White House decides is necessary as a result of its March findings.

Revenue Code Revision

The House Ways and Means Committee was scheduled to complete its work on a new revenue bill about March 1. This includes the first complete rewriting of the Internal Revenue Code in many years.

Among the committee's latest actions was approval of provisions that would permit individual taxpayers to file their tax returns on April 15 instead of March 15 but would retain the present March 15 filing date for corporations.

Of particular interest to mining were several changes in the percentage depletion provisions of the Code. The Committee (1) continued present rates of 27½ per cent for oil and gas and 23 per cent for sulphur; (2) reclassified minerals in the present 15, 10, and 5 percent categories into two groups—specific items depletable at 15, 10 or 5 percent, and a general grouping for other minerals depletable at 15 percent; (3) extended percentage depletion to the original owner for mine tailings; (4) permitted the taxpayer to treat two or more separate operating mineral interests as a single property for purposes of the depletion allowance where such interests are operated as a unit or are capable of such operation; and (5) made several changes in the tax treatment of royalty income from coal and timber leases.

In the reclassification of minerals into depletion groups, the Committee provided that the specific 15 percent group should include metal mines, rock asphalt, vermiculite, slate, and chemical and metallurgical grade limestone. The specific 10 percent group includes asbestos, brucite, coal, lignite, perlite, and wollastonite. The specific 5 percent category includes all items extended percentage depletion under present law at a 5 percent rate, except slate, and would also include peat and mollusk shells.

All other minerals not specifically listed would receive percentage depletion at the 15-percent rate except that whenever any of these minerals is used for the same purposes as stone is commonly used the depletion allowable would be 5 percent. This general group also covers minerals for which percentage depletion is not presently available, such as gypsum, natural mineral pigments and kyanite. The Committee stated that "this all-inclu-

Washington Highlights

FISCAL OUTLOOK: Clouded.
TAXES: Revisions before House.
T-H ACT: Amendments Being Drafted.
LEAD-ZINC: White House Studying Relief.
RESIDUAL OIL: Import Restrictions Sought.
SEAWAY BILL: Sent to House Floor.
COAL INDUSTRY STUDY: Proposed in House.

sive category makes it unnecessary to retain discovery value depletion."

Labor Act Amendments

The House Labor Committee has begun the task of drafting amendments to the Taft-Hartley Act. Committee aides state that the closed-door drafting sessions are likely to take several weeks. The Committee has turned down a proposal to pigeonhole any Taft-Hartley revision for this session, and has authorized a study of union welfare funds by a 7-man subcommittee, headed by Chairman McConnell (Rep., Pa.). Such a study had previously been recommended by the President.

Although there is a wide diversity of viewpoints, observers expect a bill to be reported from the Committee which will incorporate many of the President's labor recommendations. Certain of these recommendations have met with strong opposition in hearings before the Senate Labor Committee, both from industry and labor. The Senate Committee concluded its hearings early in February and has not scheduled any further action as yet.

During the course of the Senate hearings, Denison Kitchel, Phoenix attorney, appeared on behalf of the American Mining Congress, and endorsed Administration recommendations that would extend freedom of speech to representation cases, suspend the requirement for either party to a contract to bargain collectively during the term of a fixed period labor contract, require employers to file non-Communist affidavits with the NLRB, restore to States the right to regulate strikes and picketing, permit dues check-off authorizations to be revocable in writing at any time, and require a strike vote by secret ballot before a strike is instituted.

Kitchel also told the Committee that the mining industry favors enactment of specific legislation to deal with the problem of Communism in labor unions.

It is understood that the President plans to recommend that Congress give the States more leeway to write and enforce their own rules governing strikes and picketing. Several measures are now pending in Congress to accomplish this aim.

Lead-Zinc Plight

Following closed door meetings of Western mining State Senators, at which methods for bolstering the sagging condition of the domestic lead and zinc mining industries were thoroughly aired, Senators Dworshak (Rep., Idaho), Malone (Rep., Nev.), Hayden (Dem., Ariz.), and Anderson (Dem., N. M.) met with President Eisenhower to seek White House aid in solving this problem.

As a result of the meeting, the President directed Gabriel Hauge, White House assistant in charge of economic matters, to make a special study of the situation and to come up with recommendations for alleviating the critical plight of these important raw material industries. It is understood that the conferees discussed metals stockpiling and import quotas.

Congressmen from mining States have likewise banded together to spur a drive to stabilize conditions in the lead-zinc industries. A committee, consisting of Reps. Chenoweth (Rep., Colo.), Dawson (Rep., Utah), Pfost (Dem., Idaho), and Dempsey (Dem., N. M.), has been named by the House group to meet with Dr. Hauge.

Senator Malone has disclosed that the Senate Interior Subcommittee on Materials, Minerals and Fuels, which he heads, will hold hearings to bring out the critical situation prevailing in the industries. Root of the trouble, he declared, is the unabated flow of the two metals from foreign nations, produced with cheap labor.

Residual Oil Restrictions

The Foreign Oil Policy Committee, which embraces mine and rail labor and producers of oil and coal, has initiated a fresh drive to build up support for congressional action to restrict imports of residual oil.

A series of meetings is being held in major cities with a view to stimulating local "resistance groups" of industry and business leaders to throw their weight behind coal and independent oil producers in their fight to obtain import quotas on foreign residual oil which is having a crippling effect upon the domestic industries. Meetings are to be held in Boston, New York, Philadelphia, Pittsburgh, Cleveland, Cincinnati, Columbus, Indianapolis. Terre Haute, Detroit, Chicago, Springfield (Ill.), Milwaukee, Des Moines, Minneapolis, St. Paul, St. Louis, Kansas City, Lexington (Ky.), Knoxville, Fairmont (W. Va.), and Richmond (Va.).

Meanwhile, large numbers of Congressmen have taken the floors of both Houses of Congress and called for protection of the domestic coal, railroad, and independent oil industries.

Seaway Bill Progresses

For the first time in its twenty-year controversial history, the St. Lawrence Seaway proposal has run the gamut of the Senate and of the House Public Works Committee. Early last month it was sent to the House floor by the Public Works Committee and action is expected to come on it this month, with approval likely.

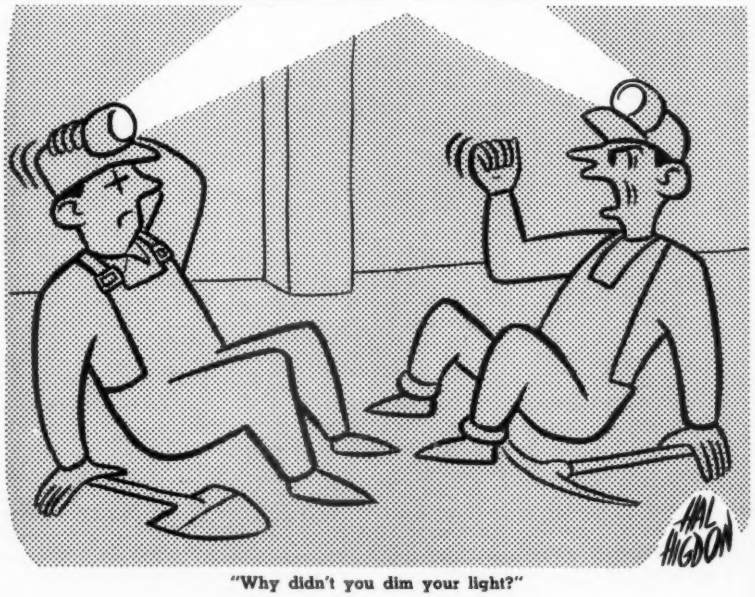
The measure would authorize the United States to join Canada in construction of the St. Lawrence Seaway. The House Committee, before reporting the bill, amended it to specify that tolls from the seaway must be used to pay the cost of the project.

Coal Study Proposed

A measure to create a Commission on the Coal Industry, with authority to study the industry with a view to recommending action to maintain it in a "healthy and progressive" state has been introduced in the House by Rep. Elliott (Dem., Ala.).

The Commission would be composed of three Senators, a like number of Representatives, and seven presidential appointees. It would have a year in which to complete the study and make its findings and recommendations to the President and Congress.

The measure is now in the House Labor Committee and no action has as yet been scheduled on it.



"Why didn't you dim your light?"

AMC Personals

Max W. Bowen was recently named executive vice-president of the Golden Cycle Corp. He has been associated with the corporation and other Carlton mining companies for many years. After graduation from the Colorado School of Mines in 1924, he did research and experimental work for several years. He was superintendent of the Independence Mill of the Portland Gold Mining Co. in Victor, Colo., and became flotation superintendent of the Golden Cycle Mill in 1929. In 1935 he became mill manager and three years later was elected a director of the Golden Cycle Corp. and vice-president in charge of milling. More recently he has been vice-president and general manager of the corporation.

J. T. Parker, manager, coal properties, Inland Steel Co., recently announced two personnel changes at the Wheelwright (Ky.) coal property.

R. D. Greer has been transferred from the Power and Mechanical Department to the Mining Department as assistant mine superintendent, maintenance. He will have charge of the maintenance and repair of all underground mining equipment except substations.

Paul C. Linkous was appointed supervisor, employment and insurance.

Endicott R. Lovell, president of Calumet & Hecla, Inc., announced the appointment of **A. S. Kromer** as general manager of the Calumet division of the company. Kromer succeeds O. A. Rockwell, who resigned to become an executive of Eagle-Picher Co.

Four officials, whose total service with The Philadelphia and Reading Coal and Iron Co. exceeds 167 years, have retired. **Thomas V. Monahan,** who has been superintendent of the company's Mahanoy division since 1935, heads the list with 48 years of continuous service. **Elmer F. Young,** who is retiring from the position of mining engineer, has completed 46 years. **Harry A. Hechler,** assistant engineer, Ashland division, has been with P & R for more than 49 years. **John Hicks,** transportation engineer for the company since 1929, has a work record of 46 years, although he had been with the company only since 1929.

Monahan's duties will now be handled by **Frank Meyers,** assistant division superintendent of the Mahanoy division. The duties of Young, Hechler and Hicks will be distributed among existing company personnel.

After six years as manager of mines with the International Mining Co. in Bolivia, **William D. Lord, Jr.,** has resigned to return to the United States.

Philip D. Wilson, mining engineer and geologist, has announced an arrangement with Lehman Brothers and the Lehman Corp. under which he will devote a portion of his time as consultant on the evaluation of mines and mining securities for clients other than of the above firms.

C. Millard Dodson has been elected executive vice-president of the Lehigh Coal and Navigation Co.

Dodson became the fifth president of Weston Dodson and Co. in 1946 upon the death of his uncle, Alan C. Dodson. He has been a member of the Board of Managers of the Lehigh Coal and Navigation Co. since December, 1952.

Elmer Isern, vice-president of Eagle-Picher Co. and general manager of the mines and milling division of that company resigned February 3. **O. A. Rockwell** has been appointed vice-president and director of the company and general manager of its mining and smelting division, succeeding Isern.

Rockwell had been vice-president of Calumet and Hecla, Inc., and general manager of its Calumet division at Calumet, Mich.

The board of directors of Calaveras Cement Co. have accepted the resignation of executive vice-president **H. C. Maginn** and have appointed vice-presidents **Arnold M. Ross, Mel J. London** and **E. M. Barker** to the company's management committee. **Gardner W. Mein** was named as alternate member of the committee. Maginn will continue to serve on the Calaveras board.

William G. Gerow was appointed chief engineer of West Virginia Coal & Coke Corp., February 8. For the past two years Gerow had been engineering assistant to the president. He was also elected vice-president of Paradise Collieries, Inc., an affiliate of West Virginia Coal & Coke Corp.

Appointment of **Charles D. Michaelson** as vice-president of Braden Copper Co., a subsidiary of Kennecott Copper Corp., has been announced by Frank R. Milliken, vice-president (mining operations) of the parent company. In this capacity, Michaelson will be the chief executive of the company in Chile with offices in Santiago.

W. W. Goldsmith has been elected president of the Elkhorn Coal Corp., succeeding **J. F. Caulfield,** who is retiring. Goldsmith and the late Howard N. Eavenson were the primary receivers for the company's properties as well as two of the ancillary receivers operating the properties in Kentucky since 1940. Receivership was terminated in November, 1953, and plan of reorganization of the corporation is now effected.

Harry C. Webb, executive vice-president of Pan American Sulphur Co., has announced the appointment of **Harold H. Jaquet** as general manager and director of Sulphur operations.

James H. Forgie, safety engineer for the Mining Division of Armco Steel Corp., retired December 31.

Forgie spent almost his entire career in mine work and had more than 25 years of service with Armco. He will be succeeded as safety engineer by **Alex Kelemen,** present training advisor and suggestion coordinator for Armco's mining division.

Kelemen joined Armco in 1934 as a coal loader. He was made training advisor of the mining division in 1947, and in 1948 was also appointed suggestion coordinator.

Phillip M. McKenna, president of Kennametal Inc., received the Holley Medal awarded by the American Society of Mechanical Engineers for his "research, development and applications which have contributed so much to the art and science of metals cutting" at the organization's annual meeting in New York.

G. T. Harley, who has been manager of the New Mexico operations of International Minerals & Chemical Corp.'s Potash Division since 1944, has been appointed special consultant to the Potash Division, according to an announcement by A. Norman Into, vice-president in charge of the division. **Carl A. Arend, Jr.,** assistant manager of the New Mexico operations, succeeds Harley as manager.

Edwin R. (Jack) Price, manager of coal properties for Inland Steel Co. at Wheelwright, Ky., since 1930 has retired. Price has gained national recognition as an industrialist and

E. R. Price

J. T. Parker

leader in the coal industry. He is now the operator member of the Federal Coal Mine Safety Board of Review. In addition he is chairman of the Coal Industry Advisory Committee to the Ohio River Valley Water Sanitation Commission, a member of the Advisory Committee of the American Mining Congress and a member of three AIME committees.

John T. Parker succeeds Price. Formerly general superintendent, Parker joined Inland Steel in 1926 at Indianola, Pa. He was transferred to Wheelwright in 1930.

R. W. Lawson, general manager of the Consolidated Feldspar department of the Industrial Minerals Division of International Minerals & Chemical Corp., has been appointed administrative assistant to Norman J. Dunbeck, vice-president in charge of the division. The appointment of **E. W. Koenig** as general manager of the Consolidated Feldspar department, to succeed Lawson, was also announced by Dunbeck. **W. Branch Lawson** has been appointed assistant manager of the department. **Charles E. Hunter,** geologist, has been appointed production manager of the department, succeeding **Ed Boone** who will continue to be associated with the department in an advisory and consulting capacity.

— *Obituaries* —

John W. Hamilton, assistant to the president of Bell & Zoller Coal Co., died January 23 at his home in Winnetka, Ill. Mr. Hamilton was active in wholesale coal sales all his adult life. At one time he was a vice-president and director of the Franklin County Coal Corp.

Fred Reebes, 62, retired general manager of the Sibley, Iowa, Cement Co., died November 7, after 30 years with the firm.

Jesse V. Sullivan, 68, former Executive Secretary of the West Virginia Coal Association, died November 20 in Charleston, W. Va. Mr. Sullivan was Secretary of the West Virginia Coal Association from 1930 until he retired in 1951. Before coming with the association he had served as editor of the *Charleston Gazette* and as secretary to former Governor of West Virginia, E. F. Morgan.

Arthur Eugene Snow, 83, Utah mining engineer, died in late December. After receiving a mining engineering degree, he reopened the Emma Mine at Alta, Utah. In 1913 he went to Detroit, Mich., to manage the Inland Delray Salt Co. for the Church of Christ and Latterday Saints and remained in that position for 21 years.

Robert F. McElvenny, 72, former American Smelting and Refining Co. executive, recently passed away at his Phoenix (Ariz.) home. At the time of his retirement in 1949, Mr. McElvenny was a vice-president of A S & R, with whom he had been associated for 46 years.

Frank James Hughes, 57, superintendent of the Glogora Coal Co. at Whitesville, W. Va., for the past 25 years, died January 24 of a heart attack.

Mr. Hughes began his mining career as a resident engineer for the American Coal Co. at McComas, W. Va. Later he was employed by the Consolidation Coal Co. (Ky.) He was also a special engineer for the Blue Diamond Coal Co. at Middlesboro, Ky. In 1929 he became superintendent of the Glogora Coal Co., a position he held until his untimely death.

Harold A. Worcester, 62, died February 1 in Montrose, Colo., four days after being elected president of the Colorado Mining Association. He suffered a heart attack at 3:30 a. m. January 30 in Denver. A widely known mining man in southwestern Colorado, Mr. Worcester was mining consultant with headquarters at Montrose. He also owned Worcester Mines, a uranium development at Atkinston Mesa, near Uravan, Colo.

For many years he was on the staff of the famous Smuggler mine at Telluride and was superintendent of the mine from 1927 to 1929 when it closed. When the mine was reopened in 1940, he became manager of the new operating company, the Telluride Mining & Milling Co. and remained with the firm until about five years ago when he resigned to enter business for himself.

Neil E. Salsich, 70, vice-president and director of The Jeffrey Mfg. Co., Columbus, Ohio, died suddenly February 2 in Bethlehem, Pa., where he was to have met with Bethlehem Steel officials during the day.

Born in Hartland, Wis., he attended Beloit College in Beloit, Wis. In 1903 he became associated with the Penna Steel Co. in Steelton, Pa., which company was later absorbed by the Bethlehem Steel Co. Mr. Salsich was with these companies 28 years in various capacities. He joined Jeffrey in 1931 and had been vice-president and director of the company since.

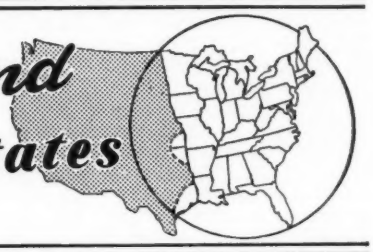
Joseph A. Schlickau, 58, died in mid-November at his home in Pikeville, Ky. A German mining engineer who lived to tell of life as a prisoner in a Russian slave-labor camp, Mr. Schlickau was a widely traveled mining consultant and lecturer. He had spent several years in this country, finally settling here in 1948.

John C. Bowen, executive vice-president of the Lehigh Portland Cement Co., passed away unexpectedly on January 19. A native of Allentown, Pa., Mr. Bowen joined the cement company in 1911 as a clerk. He rose through the ranks, serving successively as sales manager of the Allentown office, assistant vice-president, assistant eastern sales manager, and finally as executive vice-president.

He was also secretary of the Pennsylvania Supply Co., Harrisburg, Pa., secretary of the Highspire Sand & Gravel Co., Highspire, Pa., and a director of the Lehigh Valley Trust Co. of Allentown, Pa.

George S. Krueger, 68, noted Utah mining man, died recently after a long illness at his home in Salt Lake City. Mr. Krueger had worked for Park Utah Consolidated Mines Co. for 44 years. He started the Daily Judge unit of that company in 1913 and was made mine superintendent in 1925. Since 1947 he had been general superintendent for Park Utah until illness forced his retirement early in 1953.

Eastern and Central States



Opening New Ohio Mine

The Hanna Coal Co., Division of Pittsburgh Consolidation Coal Co., will have in operation this year a new deep mine near Harrisville, Ohio. A slope has been started in the southeastern part of Shortcreek Township to open up the new mine which will be known as the Glen Castle Mine. Coal will be mined in Harrison, Belmont and Jefferson Counties. Coal will be taken to the Georgetown preparation plant for processing.

The mine is expected to employ several hundred persons, drawing a portion of its force from the Dun Glen mine of Hanna Coal Co. now being worked out.

Honor Safe Foremen

Ninety-five foremen of the Red Jacket Coal Corp. recently were honored by top figures in the coal industry for their personal safety records. All members of the group had supervised crews for from one to seven years without a single lost-time accident to a crew member. The company's annual foreman safety dinner was held at Williamson, W. Va. Of the 95 foremen honored, 55 were rewarded for supervision of their men without a lost-time accident for one year, 22 for two years, seven for three years, two for four years, five for five years, three for six years and one for seven years.

In 1946 when the safety dinners were launched, only 14 men were on the honor roll and there were 444 lost-time accidents and seven fatalities within the company. In 1953, 95 men were honored for their safety records and there were only 142 lost-time accidents and one fatality.

Education Committee Meets

The Vocational Training and Education Committee of National Coal Association met at the University of Alabama January 15 and 16. The meeting opened with a luncheon at which Dr. O. C. Carmichael, president of the University of Alabama, spoke, advocating broader training for engineers. During the afternoon, the group was addressed by various faculty members who reported on the curricula available for students in mining engineering.

On Saturday morning, January 16, the members of the committee and mining faculty made a tour of the School of Mines. They then concluded the meeting with an extended discussion of the curriculum in mining engineering.

Shut Down Zinc Plant, Mine

The American Zinc, Lead and Smelting Co. announces that it has closed the Hillsboro, Ill., metal operations which were operated by its subsidiary, American Zinc Co. of Illinois. The shutdown was effective March 1 and will continue for an indefinite period. This plant was producing at the rate of 650 tons of slab zinc a month. Curtailment is the result of unsatisfactory price prevailing for slab zinc.

The American Zinc also made known that the Grasselli Mine at New Market, Tenn., was closed March 1 for an indefinite period. This mine produced concentrates at the rate of approximately 1000 tons a month of 60 percent grade.

Heavy stocks of metal, as a result, primarily, of excessive imports from foreign countries during 1953, have reduced the price level to a point where this mining operation could not be conducted on a profitable basis.

Shutdown of these two properties idled 125 men.

7,500,000-Ton Coal Use

Two huge generating stations now under construction to supply 15 billion kwh of electrical energy annually to the Atomic Energy Commission's gaseous diffusion plant near Portsmouth, Ohio, will use 7,500,000 tons of coal a year, according to Phillip Sporn, president, and V. M. Marquis, vice-president, American Gas and Electric Service Corp., New York, one of the sponsors of the utility project.

The power project is being built by two new companies, the Ohio Valley Electric Corp. and its subsidiary, the Indiana-Kansas Electric Corp., which were formed by more than a score of utilities in the North Central Area of the country.

It is planned to tap two coal producing areas, the Western Kentucky-Southern Indiana fields and the Ohio Appalachian fields.

"It was early recognized that it would be desirable to tap at least two major coal fields," they said. "The logical fields to utilize, and it appeared that they would be definitely available, were the western Kentucky-Southern Indiana fields and the Eastern Ohio-Appalachian fields. It was felt that the tapping of these two large coal areas would reduce the impact of so large a new requirement on one general area and this would be best accomplished by having at least two power plants. The problem of balance between one, two, and three plants, and the concomitant problem of different allocation of units between plants, also introduced difficult problems in coal transportation, with interesting possibilities of combining both river and wire transportation to obtain an optimum result."

The coal will be delivered on the Ohio River by barge. Two hoist towers are under construction at each station with a free digging capacity of about 1200 tph.

Commitments for both coal and haulage are for 15 years.

Plan Florida Uranium Plant

Armour & Co. has plans for the construction of a plant in the Bartow, Fla. area, to recover uranium as a by-product of phosphate fertilzer production. For several years the company has been operating a pilot plant for uranium extraction from phosphates at Bartow. They have demonstrated they can recover sufficent quantities of uranium in their operation to justify the construction of a plant for that purpose. The firm is now negotiating with the Atomic Energy Commission for the construction of the plant near their present plant facilities.

Coal Takes 4½-Mile Ride

Coal from a strip mine near Beverly, Ohio, now is riding over one of the world's longest permanent rubber conveyor belt systems.

Installed by the B. F. Goodrich Co., the rubber belt transports 800 tph of coal over a 4½-mile stretch of rolling countryside from strip mine to coal storage area on the bank of the Muskingum River. To reach its destination, the beltroad bridges county roads, spans a state highway and crosses the 500-ft Muskingum.

The beltroad takes rough terrain in stride. Belt flight in foreground climbs at an angle of 12°.

Coal carried by the conveyor system serves as the source of fuel for the Ohio Power Co.'s new 400,000-kw Muskingum River plant, near Beverly.

The entire conveyor system is composed of 14 flights of rubber conveyor belting, ranging in length from 500 ft to 2964 ft, pulley to pulley distance. The belts are 36 in. wide and travel at a speed of 600 fpm. Highest incline angle traversed is 12°; greatest decline is 12°.

Shipping Nickel to U. S.

From its vast Port Colborne, Ontario, refinery, The International Nickel Co. of Canada, Ltd., has made the first shipment of metallic nickel under a contract calling for quick delivery of 120,000,000 lb of the metal to the United States Government over a five-year period ending in 1958. Deliveries will be made at a monthly rate of 2,000,000 lb until the contract is completed.

With an additional output of 24,000,000 lb annually, International Nickel's rate of nickel production is now approximately 275,000,000 lb per year.

The additional 2,000,000 lb per month production was made possible by Inco's completion in 1953 of certain mining and metallurgical developments.

Establish Phosphate Division

Establishment of a new Phosphate Chemicals Division by International Minerals & Chemical Corp. has been announced.

The new division will provide for the continued growth of International's phosphate chemical operations, which now include a plant near Bartow, Fla., that recently went into operation, and plants at Wales, Tenn., and Tupelo, Miss. Heretofore the operation of these plants has been a part of the corporation's Phosphate Division.

Under the new production and sales program International will have two phosphate divisions. The Phosphate Minerals Division, headed by George W. Moyers, vice-president, who has been in charge of the Phosphate Division, will be responsible for the mining and refining of phosphate ores in Florida and Tennessee. The new Phosphate Chemicals Division, to be headed by Howard F. Roderick, recently elected a vice-president of International, will produce phosphate and sell chemicals.

Study Prehistoric Miners

The Michigan College of Mining and Technology at Houghton, Mich., announces that the Wenner-Gren Foundation for Anthropological Research of New York has granted $3000 to the college for research on the prehistoric copper miners and their operations on the Keweenaw Peninsula and on Isle Royale. The survey will be under the direction of Dr. Roy Ward Drier, professor of metallurgical engineering at Michigan Tech.

By use of an "atomic time clock" which measures the disintegration rate of carbon-14, it hopes to fix the date of these ancient mining operations by tests on charcoal and wood fragments found in these pits. It is indicated that mining took place in northern Michigan as long as 4000 years ago. It has never been determined where these miners came from and why they left the area with such apparent haste. This vast mining operation which supplied copper to all the Indian civilization of pre-historic America has never been scientifically investigated. The archeologist of the Smithonian Institute call this "one of the most important unsolved mysteries in North American archeology."

Elk Horn Out of Receivership

After being in receivership for 13 years, the Elk Horn Coal Corp., which has its headquarters in Charleston, W. Va., and operates mines in eastern Kentucky, is being reorganized and the receivership lifted. Arthur B. Koontz is principal owner of the firm. The plan of reorganization for the company has been approved by stockholders and by the Ohio County Circuit Court in West Virginia.

Elk Horn Coal was started as a family corporation by the late Clarence Wayland Watson, former United States senator for whom the town of Wayland, Ky., was named. It was reorganized in 1936 and 1937 and subsequently declared insolvent. The late Howard N. Evenson acted as receiver.

Zinc Institute Meeting

The American Zinc Institute announces that its thirty-sixth annual meeting will be held at the Hotel Statler, St. Louis, Mo., on Tuesday and Wednesday, April 20 and 21.

The program will consist of topics of current interests. The national and world zinc situation will be reviewed by qualified speakers. Reports on present markets and the institute's promotion and development program will be particularly featured. Specially selected guest speakers will appraise the general business outlook and Washington legislation.

The annual dinner will be held on Tuesday evening, April 20.

L. C. Campbell Honored

The Erskine Ramsay Gold Medal was presented to L. C. Campbell, vice-president, Eastern Gas and Fuel Associates on February 17. Presentation was made by the American Institute of Mining and Metallurgical Engineers during its annual meeting.

As head of Eastern's Coal Division, Mr. Campbell supervises operation of mines in Pennsylvania and West Virginia. He is also president of the National Coal Association and chairman of the Coal Division of the American Mining Congress.

He is the second Pennsylvania and the first West Virginia coal man to receive the award. J. B. Morrow, Pittsburgh, received the recognition in 1951. There were no awards in 1952 and 1953.

Three citations were contained in Mr. Campbell's award. He received recognition for his contributions to the safety and welfare of employes and to the advancement of mechanical mining.

American Power Conference

The 16th annual meeting of the American Power Conference will be held on March 24, 25 and 26, at the Sherman Hotel in Chicago. The Conference is sponsored by the Illinois Institute of Technology in cooperation with 12 universities and 10 local and national engineering societies.

The purpose of the Conference is to provide a forum for the exchange of information in the fields of power generation, transmission, distribution and utilization. All persons interested are invited to attend. For further information, write to E. R. Whitehead, secretary, American Power Conference, Illinois Institute of Technology, Technology Center, Chicago 16, Ill.

Board Reverses Gassy Rating

The Federal Coal Mine Safety Board of Review has reversed an order of the Director of the U. S. Bureau of Mines in a gassy classification case under the Federal Coal Mine Safety Act.

The mine in question is operated by the Rebecca Coal Co., Richlands, Va. It had its beginning in March, 1953, when a Federal coal mine inspector visited the mine and took gas samples at the face. These were analyzed and one was found to have a content of 0.26 percent methane. According to the Federal Coal Mine Safety Act, if a sample of air taken in a mine is found to contain 0.25 percent or more methane, the mine is to be classified as gassy. The mine operators contended that the sample of mine atmosphere was not properly taken by the inspector.

Testimony brought out the fact that the sample in question had been taken at the face of a crosscut approximately 20 minutes after the coal had been shot. The coal had been "shot hard" and the atmosphere was "somewhat hazy and a little strong when the sample was taken." Further testimony brought out that while six tests showed an average of 0.26 percent methane, the traditional two to one ratio between contraction due to burning and the volume of carbon dioxide formed by combustion was not evident. An expert witness for the Rebecca Coal Co. testified that, in his opinion as a chemist, laboratory results did not indicate the combustible gas present in the sample of mine atmosphere in question was all methane.

The Federal Coal Mine Safety Act provides that the responsibility lies with the Bureau of Mines to prove that 0.25 percent or more of methane has been found in a mine air sample. In this case the board unanimously held that the Director had failed to satisfy the statutory burden of proof to show that the mine contained 0.25 percent or more methane. In this connection, the Board said, "the Board is of the opinion that where, as in this case, the finding is extremely close to the statutory figure of 0.25 per centum and where the laboratory records show that there is a possibility of the presence of other combustible gas, the Director is under a duty to show affirmatively that the finding is based solely on the required quantity of methane and that no other combustible gas was present . . ."

Headframe for Ivanhoe

A 90-ft steel headframe has been erected at the Ivanhoe, Va., mine of The New Jersey Zinc Co. The new headframe will not be used for hoisting ore but rather for hoisting waste

rock and handling men and materials. Ore from Ivanhoe will be hauled by rail through an underground tunnel leading to the Austinville operation, about 2½ miles distant.

The new headframe is the third erected to serve New Jersey Zinc's Virginia underground operations, the Flatwoods Shaft and the Van Mater Shaft headframes having been completed earlier.

Blasting Experiments

Results of experiments on short-delay multiple blasting, conducted under actual mining conditions in the Bureau of Mines Experimental Coal Mine at Bruceton, Pa., are summarized in a published report released by J. J. Forbes, Bureau director. The report was presented as a paper at the National Safety Council's 41st annual Safety Congress, held at Chicago, Ill., in October, 1953.

Although it does not constitute official Bureau of Mines approval of short-delay blasting, the report says that extensive tests showed that this method can be used with as much safety as single-shot blasting if permissible charges are properly stemmed, loaded, and fired as recommended by the Bureau.

"For equal charge weight per shot hole," the report says, "short-delay multiple firing produced no more ignitions of gas than single-shot firing, while simultaneous multiple blasting was more hazardous."

A free copy of the publication, Report of Investigations 5026, "Experiments on Short-Delay Blasting in the Experimental Coal Mine," can be obtained from the Bureau of Mines, Publications Distribution Section, 4800 Forbes Street, Pittsburgh 13, Pa. It should be identified by number and title.

Mining Town Grows

Reserve Mining Co.'s new taconite town of Babbitt, Minn., will more than double in size this year.

Construction plans for the town call for more than 200 new homes, an 18-classroom school, a municipal building, staff house, temporary fire hall, installation of sewer and water lines for the entire eastern half of the town, paved streets and sidewalks, the start of a shopping center and other projects.

In an area which had less than one person per square mile three years ago, Babbitt's building boom will continue until it can boast a population of over 4000 in 1957. And if conditions warrant, Reserve has plans for increasing its present scheduled capacity of 3,750,000 tons a year to a possible 10,000,000 tons, which would mean more growth for Babbitt.

Work at Steep Rock Advances

First step in the development of Inland Steel Co.'s iron ore mine in Steep Rock Lake, Ont., has been taken with the awarding of a contract to Construction Aggregates Corp. of Chicago for dredging. Inland's ore body lies deep beneath Steep Rock Lake and will be mined by underground methods. However, the silt overburden as well as the water of Steep Rock Lake must be removed before underground operations may be undertaken safely.

The dredging job has been described as equivalent to excavating a hole three miles long, a mile wide and from 50 to 400 ft deep. An estimated 160,000,000 cu yd of material must be removed, a volume greater than was moved by the dredges in the construction of the Panama Canal.

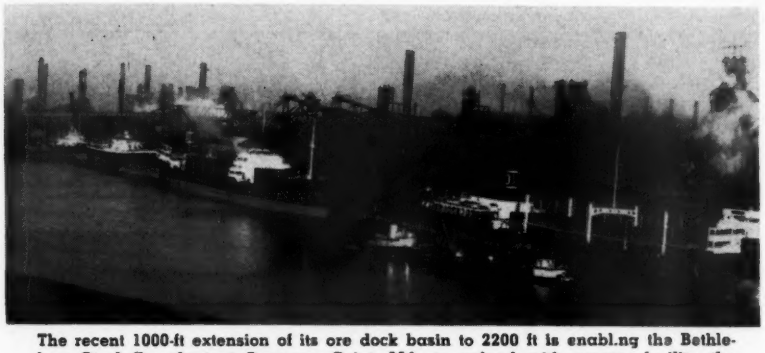
An estimated 18 months will be required for building the dredges. After that, company officials expect it will take almost five years to complete the dredging work.

The Inland mine is scheduled to begin production in 1960. When fully developed, it will have an annual output of 3,000,000 tons or more of high-grade ore.

Cerro Bolivar Producing

Iron ore from the U. S. Steep Corp.'s Cerro Bolivar operation in Venezuela, is now moving to blast furnaces in the United States. Ore trains are traveling over a newly built railway from Cerro Bolivar to Puerto Ordaz, nearly 100 miles away, where it is transferred to ocean-going vessels for the trip to the United States. Ore output in 1954 is expected to reach 2,000,000 tons. It will be increased to 5,000,000 tons in the next few years.

The project, which required as many as 7100 workers during the construction stage, will employ 1500 permanently, according to U. S. Steel officials.



The recent 1000-ft extension of its ore dock basin to 2200 ft is enabling the Bethlehem Steel Co. plant at Sparrows Point, Md., to unload with greater facility the approximately 7,000,000 tons of iron ore it normally receives annually. It is now possible to unload three large ocean-going vessels simultaneously—as shown in the accompanying photo—while a fourth vessel (extreme right) prepares to leave after having discharged its cargo. The extension project required dredging to a 40-ft depth MLW and removal of 1,350,000 cu yds. of material. Additional facilities installed were a 15-ton ore unloader and a 20-ton combination ore unloader and bridge. This extra equipment affords a greater unloading capacity of 2880 tph

Replace Tipple

A tipple is being built east of Flushing, Ohio, to replace one which burned November 8, 1953. The tipple is located on the Massillon-Belmont mine and is on the B. & O. Railroad.

At least three firms are reported to be interested in the project. They are Healy Bros., W. H. Duncan and Saginaw Dock & Terminal Companies.

More Zirconium

Zirconium production of the nation rose recently when Zirconium Corp. of America lighted a furnace at its new plant in Solon, Ohio. A rotary kiln 64 ft long will operate around the clock seven days a week at the plant.

Vitro Corporations Merge

Shareholders of the Vitro Manufacturing Co. ratified a plan for merger and reorganization at a special meeting in Pittsburgh, Pa., December 21, according to an announcement by J. Carlton Ward, Jr., president. The parent corporation and its two subsidiaries, Vitro Corp. of America and Vitro Chemical Co., will merge into one corporation.

The merged corporation will be known as Vitro Corp. of America, with offices in New York, and will include five divisions or operating units. It will retain the same capital structure, directors and officers.

The resulting divisions of the corporation will be Vitro Manufacturing Co., Pittsburgh, Pa., makers of ceramic colors and chemical products; Vitro Uranium Co., Salt Lake City, Utah, processors of uranium ore; Canonsburg Rare Metals Co., Canonsburg, Pa., engaged in the refining and recovery of metals; Vitro Laboratories, Silver Spring, Md., and West Orange, N. J., engaged in research and development; and Vitro Engineering Division, New York, N. Y., providing engineering, design and construction management services.

Produce By-Product Uranium

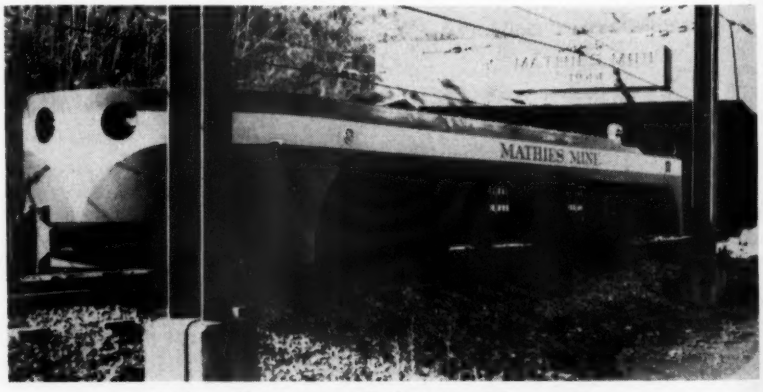
Texas City Chemicals, Inc., is now operating a production unit to recover uranium concentrate as a by-product in its new phosphate products plant at Texas City, Texas.

Uranium concentrates are recovered as a by-product of feed grade dicalcium phosphate and fertilizer grade dicalcium phosphate derived from Florida phosphate rock containing minor quantities of uranium. The unit is owned and operated by Texas City Chemicals, Inc., which has a contract to supply uranium concentrate to the U. S. Atomic Energy Commission.

The first commercial unit for recovery of uranium from phosphate rock has been operated continuously since September, 1952, by the Blockson Chemical Co., near Joliet, Ill., where uranium is recovered as a by-product of sodium phosphate chemicals. Other processors of phosphate rock are installing special units in their existing production lines to recover by-product uranium concentrate.

Missouri Iron Ore

A 25-acre site near Leeper, Mo., is being cleared of timber for construction of an iron ore treatment plant, according to recent reports. The new plant is to be operated by Visueva Mining Corp. of Poplar Bluff, Mo. N. W. Funk is president and general manager.



Mathies Has Largest Underground Locomotive

What is believed to be the world's largest and most powerful underground locomotive is in operation at Finleyville, Pa., at the Mathies Coal Co. mine pulling probably the largest coal loads ever hauled by a single unit engine. Built by the General Electric Co. the unit has a rated drawbar pull of 25,000 lb. It is capable of pulling 1600 tons on a straight, level track, or 454 tons on a 2.2 percent grade. The special high-speed, high-weight haulage locomotive is rated at 600 hp and weighs 50 tons. It is 35 ft long and has four 150-hp motors, one on each axle. Designed specifically to haul more tonnage faster, it will be used on the mine's main line track to haul coal from an underground gathering point to the cleaning plant located on the Monongahela River just down-river from Monongahela. Coal can then be either loaded into barges or railroad cars or delivered by belt to the Mitchell Power Station of the West Penn Power Co.

A Reader Comments

FOLLOWING are excerpts from a letter by G. Purcell, mining engineer, Dowty Mining Equipment, Ltd. Purcell's comments on a recent MINING CONGRESS JOURNAL article, "Longwall Mining—Its History and Future Possibilities," by J. A. Schlickau are pertinent. They, however, will have to go unanswered by Mr. Schlickau because of his recent death.

"His dream of a daily production of 4000 to 5000 tons, concentrated at a single loading point from two 600-ft longwall units is certainly fascinating, but hardly conservative. . . .

"Hydraulic props have been in use in England for seven years, and the success of many of the recent plough installations has been largely due to the efficiency of these props. They are 'delicate' in much the same way that an elephant is dainty, and their life expectation is almost as long.

"They are used at great depths where roof pressures are high, often without benefit of cribs, which are costly in labor and material. Massive sandstone roofs are being caved along a line of these props, and the ease with which they are set and withdrawn means countless extra tons of coal output.

"The best way to control a mine roof is to leave in the coal. The most satisfactory alternative is to replace the coal with a uniformly yielding support offering sufficient resistance to control the roof descent. Experience in British coal mines has shown that a prop, setting at five tons and yielding at 20 tons, will do this safely, efficiently, and economically, and to suggest that a prop yielding at 45 tons is a prerequisite of good roof control is a popular misconception of Continental mining engineers which, it is hoped, will not gain credence in America."

N. J. Zinc Cuts Production

The New Jersey Zinc Co., with smelters at Palmerton, Pa., and Depue, Ill., has announced that production of slab zinc has been further curtailed by 2000 tons per month.

Officials of the company pointed out that the cutback is due to the unprofitable price prevailing for the metal, caused by excessive imports of foreign zinc. In recent months the situation has been aggravated by a lessened demand for zinc.

The current downward adjustment of the production schedule is not the first to be put into effect by the company. During the past year mine production has been curtailed substantially. In August of 1952 one battery of furnaces at Palmerton was shut down, and toward the end of last year production at Depue was reduced.

With the March curtailment referred to above, the total result of these moves has been an over-all reduction in slab zinc output of approximately 5000 tons per month by the company.

Hanna Coal Co., Division of Pittsburgh Consolidation Coal Co. has set a new world's record for total yardage of earth moved during a one-month period. During October, 1953, a Marion 5561 shovel moved 1,622,883 cu yd of overburden at the company's Georgetown mine near St. Clairsville, Ohio. This surpassed the previous established mark by more than 115,000 cu yd. The 1500-ton machine mounts a 45-cu yd bucket and uses 4700 equivalent installed horsepower

Colorado Miners Meet

ON January 28, 29 and 30, 1954, the 57th Annual Meeting of the Colorado Mining Association was held at the Shirley-Savoy Hotel in Denver.

Harrison S. Cobb, president of the Association, opened the convention and Robert S. Palmer, executive vice-president delivered the first address. In it he reviewed the position of the domestic mining industry on the state, national and international levels. He paid particular tribute to the uranium producers and said that fissionable materials will be the salvation of mankind.

At a luncheon on Thursday, Julian D. Conover, executive vice-president of the American Mining Congress, spoke on "The Potomac Scene and Mining." Charles P. Taft, president of the Committee for a National Trade Policy, held forth on that topic.

Later a panel of lead and zinc miners discussed the lead-zinc situation. Raymond B. Holbrook, attorney of Salt Lake City, discussed the question, "Should We Amend Our Basic Mining Laws?"

Uranium held the center of the stage on Friday morning and afternoon. A panel of government and mining company officials discussed the problems of the uranium miner from every angle during the afternoon session.

The Gold and Silver Banquet was held Friday evening in the Lincoln Room of the Shirley-Savoy Hotel. Frank A. Wardlaw, Jr., International Smelting & Refining Co., acted as toastmaster. After a brief introduction of honored guests, W. Sterling Cole, chairman, Joint Committee on Atomic Energy, Congress of the United States, gave a "Report on the Atom." Cole said that the Atomic Energy Commission had been instructed to increase both foreign and domestic production of uranium several months ago. In his opinion, the demand for uranium will continue to increase geometrically from year to year.

Andrew Fletcher, president, St. Joseph Lead Co., outlined the position of the lead and zinc industry today. The title of his address was "More—Not Less." Fletcher deplored the fact that because of Government policy at the present time we are becoming more and more dependent upon foreign production for our lead and zinc supplies. He cited facts and figures showing that imports cannot be considered a reliable source of supply. He discussed the merits of several remedies which had been suggested to cure this situation, including stockpiling, import quotas, subsidies, increase in tariffs and the sliding scale import tax.

On Saturday morning J. J. Forbes, director, U. S. Bureau of Mines, reviewed the Bureau's activities in connection with the mineral industry of the West and expressed the opinion that the West still has abundant mineral resources.

Later, Assistant Secretary of the Interior Felix E. Wormser addressed the group. He stressed the need for the adoption of a minerals policy by the Administration. Wormser went on to assert that a strong and prosperous mining industry is needed by the country and discussed alternate methods of assisting the domestic mining industry.

Saturday evening at the famous Sowbelly Dinner, Joseph Campbell, Atomic Energy Commission, Washington, D. C., was the principal speaker. He congratulated the uranium producers on the splendid job they have done. He assured them that the Government will get out of the uranium business whenever national defense permits.

The following officers were elected to serve the Colorado Mining Association during the coming year: Harold S. Worcester, president; Charles H. Chase, honorary president; and vice-presidents E. D. Dickerman, M. B. Cloonan, T. J. Rummel, Max W. Bowen and W. E. Burleson. H. W. C. Prommel was elected treasurer and Robert S. Palmer, executive vice-president. The entire mining world was saddened by the death of Harold S. Worcester just a few days after his election as president of the Association.

Plan Manganese Mine

Quebec Metallurgical Industries, Ltd., of Ottawa, Canada, has taken over the Blue Ore group of claims six miles southeast of Dillon, Mont. The Blue Ore group is opened by a 250-ft tunnel giving a depth of about 150 ft below the surface. Reportedly, there is a good showing of black manganese oxide ore in a vein formation. It is planned to extend the tunnel and to do further development and exploration work on the property.

Consolidate Coal Operations

Operations of the Castlegate and Kenilworth mines in Carbon County, Utah, have been consolidated, according to a recent announcement by Independent Coal and Coke Co. Consolidation of the two properties is the result of a drop in demand for coal, according to company officials.

Production at the Castlegate mine will be reduced, but the coal cleaning plant will continue in operation, treating coal from Kenilworth and the company's Clear Creek mine. Employment at the Kenilworth mine will be increased as will production. Some Castlegate miners will work at Kenilworth. E. O. Jackson, superintendent at Kennilworth, has been named superintendent of the combined Kennilworth-Castlegate operations. Stanley Harvey, former superintendent at Castlegate, has been named superintendent at Clear Creek, succeeding William Moorehead, who is retiring.

It is reported that Independent Coal and Coke Co. plans to connect the Kenilworth and Castlegate mines underground, to realize significant operating economies. About 4500 ft of entry work would be required to make this connection.

Utah Power and Light Co. is constructing a steam electric-generating plant at Castlegate, which will burn coal from the properties of the Independent Coal and Coke Co.

Looking at Coronado

Holdings of Coronado Mines, Inc., near Nogales, Ariz., have been acquired under a two-year option to purchase by the Duval Sulphur and Potash Co. of Houston, Texas. An extensive program of exploration by diamond drilling is planned.

Contract for the diamond drilling is held by the Joy Manufacturing Co. and covers a minimum of 8000 ft of drilling. Depth of holes will vary from 500 to 1500 ft, and the number of holes will be determined by results obtained as work progresses. The first hole was started on November 25, 1953, and the second on December 2. A drilling average of 40 ft per day per rig is expected. Initially, BX cores are being recovered, but plans call for AX at greater depths.

Coronado's holdings consist of 163 unpatented claims, including the Red Mountain group of 33 where present

exploration work is being done. The Red Mountain is a low-grade disseminated deposit, believed to be fairly large, containing principally copper with some molybdenum.

Milton Leon, 208 Wright Bldg., Tulsa 3, Okla., is president and general manager of Coronado Mines, Inc.

Pend Oreille Reports Record

The Pend Oreille Mines and Metals Co. has disclosed it milled 500,042 tons of zinc-lead ore, a 40 percent increase, during 1953 in the Metaline district of Washington. This is the first time the company has exceeded the 500,000-ton mark, and the company has plans for expanding operations to a capacity operation of 1,000,000 tons of ore a year. The daily output is now averaging between 1500 and 1600 tons of ore.

Oregon Miners Meet

The Oregon Section of the American Institute of Mining and Metallurgical Engineers will be host to the AIME Pacific Northwest Metals and Minerals Conference to be held in Portland, Ore., April 29 through May 1, 1954.

The three-day technical program will be open to the public and includes four sessions on metals technology. They will feature iron and steel and both extractive and physical metallurgy. In addition, two sessions are planned on industrial minerals, one on engineering geology, one on groundwater and one on mineral industries education.

Homestake Production Up

South Dakota's Homestake mine produced about 10 per cent more gold and 11 per cent more silver in 1953 than in any previous year, according to a report on the state's production by the U. S. Bureau of Mines.

Production last year totaled 1,368,059 tons of ore valued at $18,251,984, compared to last year's output of 1,209,884 tons valued at $16,379,986. The ore tonnage figure and its value is the highest since 1950 when 1,265,118 tons were produced valued at $19,264,084, according to a tax report filed by the company.

Although the exact gold output was not given by the bureau's report, it says South Dakota's lode mines produced 526,406 fine oz of gold, 134,324 fine oz of silver and 10 short tons of lead. Output was from four lode mines. In addition to Homestake, the Bald Mountain Mining Co. operated the Portland, Dakota and Clinton group of mines and its 370-ton all-sliming cyanide mill. American Smelting and Refining Co. made several shipments of lead-silver-gold ore from the Spokane and Silver Queen mines.

California Here We Come

SEPTEMBER 20-24 are red-letter days for all those interested in mining. Executives, engineers, operating men and legislators will assemble in San Francisco for the Metal and Nonmetallic Mining Convention and Exposition of the American Mining Congress. Demand for exhibit space has been so heavy that the exhibit area has been substantially enlarged. Mining manufacturers are now completing elaborate plans for exhibiting their equipment. They are leaving no stone unturned to make the Exposition of the greatest value possible.

Every kind of mining and milling machinery, equipment and supplies will be seen at San Francisco's Civic Auditorium, where the meeting will be held. Many new types of equipment will be presented for the first time together with improved models of all standard mining machines. Experience has shown that this Exposition presents an unparalleled opportunity to see, examine, compare and discuss at first-hand equipment of all kinds and its suitability to various operating conditions. At the Convention sessions, which will also be held in the Civic Auditorium, papers describing successful mining operations and talks on economic and governmental matters of import to the mining industry will be presented. The Program Committee will meet early this summer to consider hundreds of suggestions from thoughtful mining men in every part of the country.

The San Francisco meeting is one which no mining man will want to miss. Make your plans now to attend. Write to the American Mining Congress, Ring Bldg., Washington 6, D. C., for hotel reservation blanks or directly to the Housing Bureau of the San Francisco Convention and Visitors Bureau, Room 300, 61 Grove St., San Francisco 2, Calif., for hotel accommodations.

Kaiser Buying Fluorspar Ore

Kaiser Aluminum & Chemical Co. is now buying and milling custom ore at its Fallon (Nev.) fluorspar flotation mill. The majority of the ore for the mill is mined by Kaiser at its mine 60 miles from Fallon, but the purchasing program is designed to afford a market for other mines.

The four main custom shippers, according to H. D. Phillips, plant manager, have been Joe and Bob Keller, who ship about 200 tons monthly from their mines in Dixie Valley and Iowa Canyon; Charles Cirac has been shipping from his Box Canyon mine; and R. L. Tiefel and C. J. Smith from the Venice Canyon mine. Kaiser upgrades the ore to acid grade by flotation and ships it to a chemical plant near Pittsburg, Calif., for conversion to synthetic cryolite which Kaiser uses in its aluminum plants in Washington.

Siskon Cyanide Plant

The cyanide plant at the Siskon mine on Dillon Creek in Siskiyou County, Calif., which has been operating since October, is now treating about 100 tpd of ore. The plant was designed to treat the gossan gold ore discovered when roads were built to move in diamond drilling equipment to prospect for sulfide ore bodies.

Kennecott Cuts Production

A substantial reduction in the demand for copper forced the Utah Copper and Nevada Mines Divisions of Kennecott Copper Corp. to curtail operations to a six-day week in mid-February.

In both divisions the mine, mills and refinery were operating seven days a week, and employes were working 48 hours a week before the curtailment. Under the new schedule, operations are closed down Sundays and employes work 40 hours a week.

The cut in tonnage at Utah Copper Division represents about a 14 percent reduction in output. Production was running at 580,000 tons of ore per week. Under the new schedule 498,000 tons is mined and milled weekly.

Cut in tonnage at the Nevada Mines Division also represents about a 14 percent reduction in output. Production was reduced from 140,000 tons to 120,000 tons per week. The cutback in operations did not cause any layoffs among the two division's 7200 employes.

Develop Mexican Sulphur

Potentionally one of the biggest sulphur deals in years was recently concluded as United States capital and technical skill were merged with Mexican natural resources to produce sulphur in the Isthmus of Tehuantepec, state of Veracruz, Mexico.

Texas International Sulphur Co., with headquarters in Houston, Texas, joined with Central Minera, S. A., of Mexico City, to undertake development of sulphur properties in Tehuantepec. Under the contract TIS received the rights to explore the sulphur properties of Central Minera there.

Mexican Gulf Sulphur Co.'s plant is already completed and will produce sulphur at the rate of 200,000 tons per year, and Pan American Sulphur Co. has announced plans to begin construction of a Frasch plant at an early date.

Interest in Tehuantepec has been high since geologists found that the geology there matches that of the Texas and Louisiana Gulf Coast where more than 80 percent of the world's sulphur is now being produced, the only such "match" in the world.

U. P. Finds Titanium

Union Pacific Railroad has found large deposits of iron ore, much of it rich in titanium, by exploratory drilling in southeastern Wyoming. The iron-titanium deposit, in an area of approximately 250 sq miles, surrounds a major ore body on Iron Mountain, 25 miles northeast of Laramie. In anticipation of development of the newly-found deposits, the company has completed a survey for a 30-mile railroad spur to the mountain.

The presence of iron in the area has been known for a century, but it was not until 1943 that the U. S. Bureau of Mines began exploratory drilling. In 1951 a Union Pacific geologist made a magnetometer survey of the area. Since then, more than 16,000 ft of diamond drilling each year was done in 1952 and 1953. More drilling is planned for 1954.

Riddle Progress

M. A. Hanna Co.'s multi-million dollar nickel smelter at Riddle, Ore., is shaping up rapidly. Work has begun on an 8500-ft bucket tramway; concrete foundations for four furnaces have been poured; four crushers have been placed at the south end of the site; the crusher and sampling building has been started, and foundations have been prepared for a transformer.

Ambassador Mines Sold

Stockholders of Sunny Peak Mining Co. followed the lead of Ambassador Mines Corp. stockholders and approved the purchase of Ambassador mines. Ambassador stockholders will receive two shares of Sunny Peak nonassessable, 20-cent par stock for each share of Ambassador stock held, according to F. W. Kiesling, secretary-treasurer of Sunny Peak.

The Ambassador firm will go out of existence following completion of the transaction. Ambassador assets include mining claims and machinery in Sanders County, Mont. The mining equipment will be moved to Sunny Peak's Gubser silver property near Conconully, Wash.

Knob Hill to Mill Ore

Agreement has been reached for the Knob Hill Mines, Inc., to mine and mill ore in the Republic district of Ferry County, Wash., for the Day Mines, Inc., officials of the firms have announced. Knob Hill is a silver-gold producer and the Aurum holdings of Day Mines adjoin Knob Hill to the southwest.

A. R. Patterson, general superintendent for Knob Hill, has reported that his company has been mining along the Aurum property line for several years, and that several thousand tons of ore from that property were mined and milled during the mid-forties.

Henry L. Day, president and manager of Day Mines, said mining and milling of company ores started in December with the grade of the ore medium. He noted that it is convenient for his firm to have Knob Hill to do the work. Mining is being done from the Knob Hill 600-ft level. Miners are currently sinking the main shaft of the Knob Hill to open the ninth level, about 1325 ft down.

Acquire Utah U-Ore Sites

East Utah Mining Co., Salt Lake City, Utah, recently acquired control of approximately two sections of ground in Dry Valley, San Juan County, Utah. This property is about ten miles south of the Utex Co. property, presently the largest producer of uranium ore in Utah.

East Utah has two drilling rigs prospecting the property and has put down a number of drill holes from 400 to 600 ft deep.

AEC Reports Uranium Progress

The Atomic Energy Commission has released its fifteenth semiannual report to Congress and, among other things, cited in detail the progress in the Commission's uranium program. Exploration and the search for uranium was carried on with great vigor. The boom in uranium mining has brought about the construction of several new ore processing mills. Completion of the new plant at Bluewater, near Grants, N. M., by the Anaconda Copper Mining Co., increased to nine the number of uranium ore-processing plants in the U. S.

Construction of a tenth plant is scheduled to start early in 1954 at Shiprock, N. M., by the Kerr-McGee Oil Industries, Inc. This plant will treat ores being produced in the Lukachukai Mountain area of northeastern Arizona and other areas on the Navajo Indian Reservation, together with those stockpiled at the Shiprock ore-buying station over the past two years. The report further disclosed that Anaconda is contemplating construction of additional facilities to treat sandstone-type ores being produced in the Grants area. The ores are now being stockpiled at the Grants ore-buying station.

About the other western mills, the report said facilities were enlarged by Vanadium Corp. of America at its Naturita and Durango (Colo.) plants and by the Climax Uranium Co. at its Grand Junction plant. Additional processing plants are being considered for treatment of ore reserves recently developed in the Bedrock (Colo.) and in the Moab (Utah) area. Expansion of facilities at Monticello is also planned.

The report made no mention of uranium ore production, but said the quantity of fissionable materials produced during the year's second half met the approved schedules, with the trend of production continuing to rise. The report said ore is now being produced from more than 525 mines, mostly on the Colorado Plateau in Arizona, Colorado, New Mexico and Utah. It pointed out that mine operators who rather recently were working deposits near the surface or along canyon rims, are now going deeper.

A new "important potential source" of uranium was reported to be under investigation in Florida. Production from existing domestic sources other than the Colorado Plateau area have been in the "Marysvale (Utah) district of south-central Utah and the area in South Dakota and Wyoming surrounding the Black Hills." Other centers of potential importance are the Colorado Front Range, the Boulder Batholith area near Boulder, Mont., and several widely separated points in Arizona. It was also pointed out that recently an area of widespread ore deposits was discovered in the Wind River Basin in Fremont County, Wyo., and active prospecting is in progress.

As to the Florida investigation, the AEC said that in the past some uranium has been obtained as a by-product of commercial phosphate rock, which is produced from the lower layer of the so-called "Bone Valley formation" in Florida. The formation has an upper layer known locally as the "leached zone" which generally has been discarded because it was believed to be waste, even though scientists have known for some time that it contains uranium in concentrations somewhat higher than in the phosphate rock itself.

The main problem contributing to this discarding has been the question of how to get the uranium out of the upper layer efficiently and economically. Now processes have been developed for efficient extraction and have proven promising enough to warrant testing on a pilot plant scale.

The report mentioned that the second plant to recover uranium from phosphate rock had been completed by Texas City Chemical, Inc., at Texas City, Tex., and that two additional plants were nearing completion in Florida for the same purpose. These are under construction by International Minerals and Chemical Corp. and Virginia-Carolina Chemical Corp.

The Bureau of Public Roads was cited as allocating $1,054,000 for the construction of 131 miles of additional access roads into uranium producing areas of the Colorado Plateau and in South Dakota.

Ship Lead-Silver Ore

After 47 years of inactivity, ore is being shipped from the Cleveland mine northwest of Boulder, Mont., by Harold Longmaid and John Hopkins, who have leased the mine from its owners. The lead-silver ore is being shipped to the East Helena smelter of the A. S. & R. Co.

Mines Safer in Idaho

Last year Idaho equaled its best year on record from the standpoint of mine fatalities, according to State Mine Inspector George McDowell. The state had five mine fatalities, a drop of 10 from 1952.

Several mines worked without a lost-time injury and others made important reductions in accidents during the first three quarters of the year. McDowell said that in the first nine months the state's mines worked 8,969,171 man-hours and had 878 lost-time injuries, which resulted in 44,578 days lost.

New Exploration Venture

The New Jersey Zinc Co. has negotiated a contract with Verde Exploration, Ltd. for the further exploration of properties owned or controlled by Verde in the Jerome mining district of Arizona.

The Jerome district, located about 25 miles northeast of Prescott, Ariz., where the company has an exploration office, was formerly an important mining district because of the location there of two large copper mines, the United Verde and the United Verde Extension. Both mines have largely been worked out, United Verde Extension ceasing all operations in 1939 and United Verde ceasing copper mining in 1951.

Although considerable exploration work has been done in the areas near the mines, there remains much more work to be carried out in a promising zone located 3½ miles southeast of Jerome. The company will concentrate its attention here, utilizing all applicable exploration techniques.

Phosphate Plant Producing

Full-scale production was scheduled to start on January 4 at the new phosphatic fertilizer plant of Western Phosphates, Inc., at Garfield, Utah. The facility will have an initial productive capacity of 92,000 tons annually, according to J. P. Jones, vice-president and general manager.

Design of the plant is such that considerable expansion above the 92,000-ton figure can be accommodated. Grinding of phosphate rock from Leefe (Wyo.) mines was started during December at the Garfield installation. Tuning up of the plant took up most of the month of December.

AEC Drilling Announced

Approximately 1,200,000 ft of hole, costing about $3 a foot, will be drilled by the Atomic Energy Commission during the current fiscal year on the Colorado Plateau in the search for more reserves of uranium ore. The announcement was made by Sheldon P. Wimpfen, manager, Grand Junction Operations Office of AEC in a speech at Grand Junction. Preparatory work, technical services and other necessary parts of the AEC exploration program will bring the total cost of the program to around $7,000,000.

Banner Concentrator

Banner Mining Co. hopes to have its 400-tpd concentrator in operation at its Mineral Hill (Ariz.) property by May 1. Banner is also starting a small exploratory shaft on a new prospect about 4000 ft to the east of the main copper ore body on the old Barnsdall claims. The firm is controlled by Rico Argentine Mining Co., Tintic Standard Mining Co., and other Salt Lake City and Texas interests.

About 10,000 tons of development ore is now above ground and will go into the mill as soon as the concentrator is completed. Development work to date in the Barnsdall has centered around preparations for stoping and regular mine operations. A new hoist has been installed in the vertical shaft and an inclined shaft is now in use removing development ore. The properties are located 15 miles southwest of Tucson.

Smelters Cut Work Week

Bunker Hill & Sullivan Mining & Concentrating Co. went on a five-day week operation on February 1 because of the low prices for lead and zinc. The firm operates in the Coeur d'Alene district of Northern Idaho. It has been on a six-day week since July 1, 1949. No indication was given as to when the plant could be expected to go back to six days. Sullivan Mining Co. also reduced the zinc production of its Silver King plant at Kellogg, Idaho by 25 percent on February 1. This resulted in a cut of approximately 1200 tons of refined zinc a month. The action was taken also because of the low prices for zinc.

Close Uranium Plant

Operation of an experimental pilot plant for processing uranium ores at White Canyon, Utah, has been discontinued by the Vanadium Corp. of America.

Inability to reach satisfactory terms for an operating agreement with the Atomic Energy Commission was given as the reason for termination of the Corporation contract with AEC. Sheldon Wimpfen, AEC chief at Grand Junction, Colo., said AEC and VCA officials did not see eye to eye on the process employed at the White Canyon plant.

"Pretty far ahead of our times, aren't we?"

Communications at Climax

(Continued from page 52)

be pointed directly to radio energy. Considering that well over 100,000,000 electric caps are used each year, the hazard appears to be minor. However, it is the operator's responsibility to prevent accidents of this nature and to try to avert a recurrence.

Our radio telephones operate on about a 20-watt output, which, according to standards approved by the U. S. Bureau of Mines, places them in a safe category if no transmitting is done within 100 ft of any blasting line. In maximum hazard areas the wires of blasting circuit must be off the ground, with the length of wire exactly half the radio wave length (4900 ft on the Phillipson Level and 8033 ft on the Storke Level); the blasting cap must be in the center of the wire and parallel to the trolley line (antenna). All of these conditions are difficult to meet in underground mining. As a precaution, shunts are left on all blasting circuits until time of blasting. Regardless of our favorable or safe condition, we feel it is advisable to keep locomotives that are equipped with radio units out of areas using electric blasting.

Maintenance Reasonable

The maintenance costs for the "trolleyphones" equipment and system at Climax have been quite reasonable, considering that the equipment is occasionally exposed to severe concussion due to nearby heavy blasting in loading drifts. Secondary blasting within 150 ft of a locomotive has involved the detonation of 2000 lb of dynamite. Additional shock mounting and protection of the speaker by ⅛-in. perforated plate, as shown in the photograph, has greatly reduced maintenance. The construction of the transmitter receiver unit is also important, particularly the plug-in components of the entire wiring circuit. A maintenance man of minimum experience can replace the faulty components and have them returned to the factory for repairs. In addition, the unit is compact, 9¾ in. high by 4½ in. wide by 17⅝ in. long. The nine-in. heavy duty speaker and press-to-talk microphone complete the unit.

Seek to Expand System

There is no doubt in the minds of management at Climax that the radio has proved its value in the haulage operation. However, we are still greatly in need of verbal communication in other phases of our operation. It would be advantageous to permit the brakeman to talk to the motorman while coupling or rerailing cars or spotting cars under loading points. Where grizzlies and ore passes are used, it is necessary for men at the top and bottom to be in constant communication. This is particularly so when blasting or loading is taking place. A system other than signal lights or buzzers would be very beneficial for this purpose. Eventually methods will be found to answer all these problems.

The writer wishes to thank the Climax Molybdenum Co. staff and the Femco Corp. for their help in preparing this paper.

APPROXIMATE INVESTMENT AND MAINTENANCE COSTS:

Average Cost per Unit Delivered	$700.00	
Cost per 22 Units		$15,400.00
Accessory Equipment for Installation:		
Impedance Matching Transformers		270.00
Condensers for bypass on trolley dead blocks		60.00
Total Investment		$15,730.00

MAINTENANCE COST FOR 20-MONTH PERIOD:

Cost of replaced parts for all units	$800.00
Average labor cost per 6-day week; 24-hour operation (including installation)	12.00

Atomic Powered Locomotives

Dr. Lyle B. Borst, professor of Physics at the University of Utah and former research staff member of the Atomic Energy Commission has announced that he recently completed design of an atomic locomotive. According to Borst, the 7000-hp engine would run for a year on 11 lb of uranium and would have the "fast pick-up" of electric locomotives.

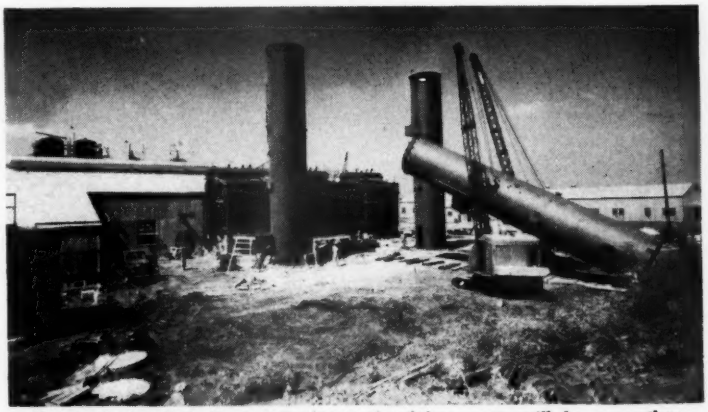
A reactor for the proposed atomic-powered locomotive is already on the designing boards of the Babcock and Wilcox Co.'s atomic energy division according to C. H. Gay, vice-president in charge of the division.

Gay said that the reactor, employing fluid rather than solid fuel, was of extreme interest in the field. "Such reactors have been previously designed, but never for such a heavy demand of energy," he said. However, there are several problems that have to be overcome before the design can be completed. "How well these problems can be overcome will have a great bearing on the efficiency of the power plant of the locomotive, and consequently on how soon it will be built," Gay said.

According to Borst the atomic locomotive would be economically practical if the cost of its fuel were sufficiently low. To obtain performances equal to diesels, Borst said, the atomic locomotive would have to use fuel costing no more than $11,000 a pound.

The engine would obtain its power from steam generated by a chain-reacting solution of uranyl sulphate. Steam would drive generators powering the wheel-driving motors.

New Texas Sulphur Project



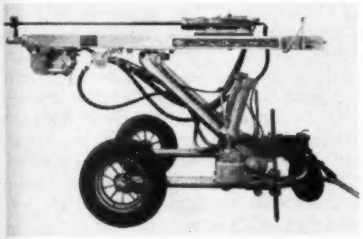
Texas, the nation's largest producer of sulphur, soon will have another mine producing the yellow mineral. At Nash dome near Houston, Freeport Sulphur Co. is constructing a plant, its fourth new project in that state and Louisiana since 1951. Derricks maneuver into place the last of three huge heat reclaimers. Nash dome is scheduled to begin production in the first quarter of 1954

Manufacturers Forum

Offer New Wagon Drill

A new wagon drill has been announced by Gardner-Denver Co. of Quincy, Ill. The complete new unit is known as the Gardner-Denver Model URM, and consists of a new drill wagon with dual hydraulic lift, four-in. drill, and RM chain feed.

A single drill control handle, conveniently located within the operator's



reach on the chain feed, operates all drilling, blowing and hole-cleaning actions. The URM accommodates eight-ft steel changes as standard. Additional details may be obtained by writing the manufacturer.

Air Classifier Announced

Hardinge Co., Inc., York, Pa., announces a completely new type of dry classifier—the "Gyrotor" Air Classifier, for use in continuous separation of coarse and fine air-borne particles. It can be used in closed circuit with a pulverizing mill or as a self-contained sizing unit for any moving stream of air-solids mixture.

The classifier is basically an inverted, truncated-cone shell with a motor-driven, bladed rotor of similar shape revolving on a vertical center axis inside the outer shell. The raw mixture of coarse and fine air-borne material is fed in from the bottom of the cone, passes upward in the annular space occupied by the whirling blades, and discharges through a central opening in the top. Oversize not removed by the impact of the blades drops out in the eddy current above the rotor and centrifugal action deposits it on the outer shell of the classifier, where it slides to the oversize discharge at the base of the shell.

Make Belts More Flexible

A new breaker strip for conveyor belts which uses nylon combined with cotton to replace the conventional all-cotton breaker strip has been developed by United States Rubber Co. The new nylon breaker strip, called "Nyton," uses nylon in the warp or lengthwise direction and cotton in the filler or crosswise direction. It anchors the carcass of the belt to the rubber cover.

Principal advantage of the nylon-cotton mixture over the all-cotton breaker strip is that it makes the belt more flexible in the length-wise direction, thus taking up the shock of impact during loading operations, according to U. S. Rubber.

The "Nyton" breaker will be available in all U. S. heavy-duty conveyor belts where severe service is expected, including the U. S. Giant and U. S. Matchless lines.

Develop New AC Motor

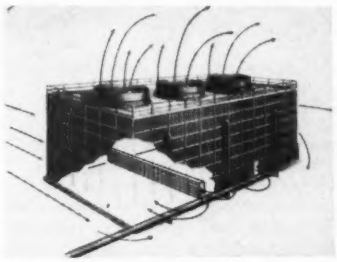
A new line of well protected, versatile squirrel-cage induction motors was announced recently by the Reliance Electric and Engineering Co. The line, including protected and enclosed motors for all industrial purposes, is being built to recently adopted standards of the National Electrical Manufacturers Association.

Research in the fields of new insulating materials, ventilation, heat transfer and more efficient electrical designs, according to Reliance, has made possible greater horsepower in more compact space with equal and in some cases even greater liberality than in past designs. Research has also led to better protection of the motor windings, leads and bearings.

Further data is available on request. Write to the Reliance Electric & Engineering Co., 1088 Ivanhoe Road, Cleveland 10, Ohio.

Improve Cooling

Significant progress toward the control of recirculation in cooling towers has been introduced by the Santa Fe Tank & Tower Co., Los Angeles. A new design feature, using "Equalizing Channels" between each cell of the tower, balances pressure and reduces reciriculation. According to Santa Fe engineers, this is the "logical solution to a problem (recir-



culation) which invariably impairs the performance of a cooling tower."

To prevent exhausted air from being forced downward into the inlet area and recirculated through the tower, Santa Fe has introduced "Equalizing Channels" into large, multi-cell towers which relieves the pressure differential existing between the windward and leeward sides. Pressure is thereby equalized on both sides of the tower, and during the presence of strong horizontal winds the channels allow air to pass completely through the tower in order to equalize pressure.

Control DDH Deflection

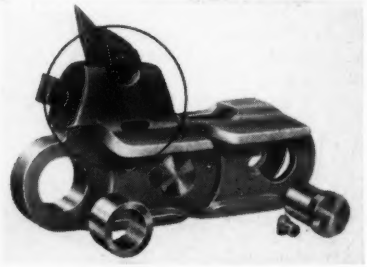
Robert D. Longyear, president of the E. J. Longyear Co., recently reported the use of retractable wedges to control deflection of deep diamond drill holes. The steel deflecting wedge developed and successfully used by the company will accurately deflect a diamond drill hole in any desired direction at any desired depth and furnishes a directional control heretofore impossible, according to Longyear. Maximum deflection with the retractable wedge is two degrees and changes in direction of a hole are made by a series of deflections from 20 to

50 ft apart, the wedge being removed after each deflection.

Long year made these facts known at a weekly luncheon meeting of the Northwest Mining Association in Spokane, Wash., early in December. He went on to say that improved drilling techniques and the need for new ore bodies is stimulating deeper diamond drilling and in the Michigan iron range a diamond drill hole has been put down to a depth of 6300 ft.

Improve Cutting Chain

Streamlining has made drop forging possible for a coal cutter chain part formerly thought impossible to produce except by machining an alloy steel casting. The bit carrying body

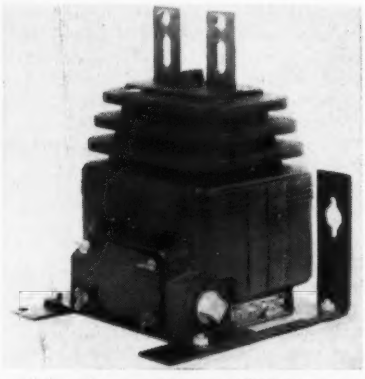


of cutting chains produced by The Bowdil Co., Canton 7, Ohio, is drop forged and securely welded to cutting chain links. All wearing parts of Bowdil chains are now drop forged to give greater strength, longer chain length and better cutting performance, according to the manufacturer.

New Outdoor Transformer

A new butyl-molded current transformer for outdoor applications up to 5000 v has been announced by the General Electric Co.'s Meter and Instrument Department.

Smaller and lighter than previous



models, the new Type JKW-3 transformer represents the first successful application of the butyl process to transformers of the higher-voltage outdoor type. According to G-E engineers, the previous maximum voltage for butyl-molded outdoor transformers was 600 v.

V-Belt Has Greater Capacity

Raybestos-Manhattan, Inc., Manhattan Rubber Division, Passaic, N. J., has introduced an improved "superpower" V-belt which, the company says, has a horsepower capacity average of 40 percent over standard V-belts. The company states that in addition the belt, known as the R/M Super-Power V-Belt, lasts relatively longer than standard V-belts.

The belt has the same advantages of smooth running performance claimed for Manhattan's Condor V-Belt, but its design incorporates a new synthetic fiber strength member for greater power. The new belt's construction is of all synthetic rubber, and is also oil-proof, non-spark and heat-resistant. Descriptive folder No. 6628 is available on request.

Mosebach Changes Hands

All outstanding stock of Mosebach Electric & Supply Co., 1115 Arlington Ave., Pittsburgh 3, Pa., has been acquired by Harold J. Evans and Ralph M. Nadler from Ray Hampton and Associates. Hampton has resigned his position as Mosebach president to return to his own distributing business in West Virginia.

Filter, Lubricate and Regulate Air

The CCA Products Division, Breco Manufacturing Co., Baltimore 2, Md., announces a new combination filter, regulator and lubricator for compressed air lines. This unit —the Breco Filter-Lube-Regulator, Type RFL —is designed to eliminate the complicated piping and fittings required for the installation of individual filters, lubricators and regulators. It simplifies piping. Only two connections are required for connection in any air line.

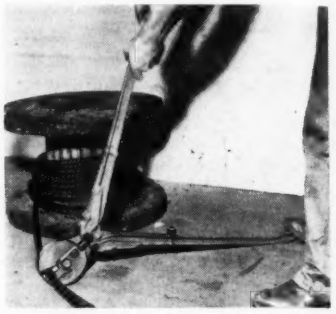
Offer Lightweight Roofing

In answer to the growing demand in industry for a maintenance-free metal roofing material of thinner gauge, Aluminum Co. of America is enlarging its line of industrial roofing materials with the addition of a new, lightweight corrugated aluminum sheet. Made of the same durable high-strength alloy as the standard 0.032-in. material, the new Alcoa Aluminum Corrugated Industrial Roofing and Siding product is only 0.024 in. thick.

This lightweight product will fill the need where narrow spans in the roof support structure do not require the extra high beam strength of the 0.032-in. material.

Protect Cable While Cutting

Two new shear-type tools for cutting steel cable and wire rope have been developed by the engineering department of H. K. Porter, Inc., Somerville, Mass. With passing jaws,



notched to lock the cable in during the cut, these shears have proved effective for all cable including ACSR, soft and hard rope, stranded guy wire and improved plow steel up to Brinell 400 or Rockwell C 42 hardness according to the manufacturer. The design minimizes crushing or deforming either coarse or fine stranded cable in the rapid cutting action. Detailed information is available from manufacturer.

Announce Metal Cleaner

Development of a complete line of seven emulsion cleaners was announced recently by Turco Products, Inc., manufacturers of industrial chemical processing compounds.

Turco emulsion cleaners, according to the manufacturer, offer a very simple spray-on method of removing grease and oil from metals and machinery. Added in small amounts to petroleum solvents, Turco emulsion cleaners act with these solvents like soap acts with water. They increase the penetrating power of the solvents, speed the cleaning action and improve the rinsing properties, according to Turco.

Complete literature is available upon request. Requests should be addressed to Turco Products, Inc., 6135 South Central Ave., Los Angeles 1, Calif.

Warning System for Magnets

An automatic alarm system which is said to enhance the efficiency of magnetic separators by virtually eliminating the possibility of human error has been announced by Eriez Mfg. Co., Erie, Pa.

The new control, called Magnalarm, has a sensitive ferrometer which con-

stantly measures the quantity of tramp iron as it accumulates on the surface of a permanent magnetic separator. It reacts on a circuit to trip the alarm as soon as a predetermined accumulation is reached.

Tell of New Motor Line

A completely redesigned line of electric motors to meet new National Electrical Manufacturers' Association rating standards has recently been announced by the Louis Allis Co. of Milwaukee, Wis. These new motors are available in all standard enclosures—open, drip-proof; totally enclosed, fan-cooled; and explosion-proof. They are built up to frame size 326 (40 hp at 3600 rpm).

Save Cutter Bits

A new undercutter bit with stop, the CCS-2, designed especially for continuous miners, is announced by Carboloy Department of General Electric Co., Detroit.

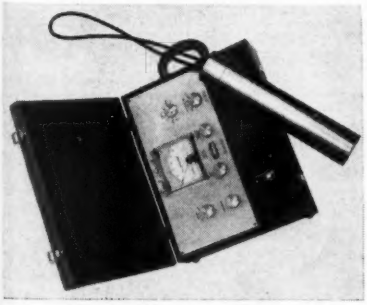
The new bit can be used on all cutting machines that employ ½ by 1-in. bits. The addition of a stop on the new bit, according to Carboloy Department, keeps it from slipping through the chain and into the sprocket of the machine when biting into tough coal formations.

Churn Drill Repairs

A new churn drill tool repair service is now available to blast hole drill users in eastern states at the Bucyrus-Erie sales and service station at Englewood, N. J. It is located at 214-216 South Dean St.

Royal Scintillator Introduced

Precision Radiation Instruments, Inc., have introduced a new model scintillator. Model 118 "Royal Scintillator" can be operated from an air-



craft or a moving vehicle. The entire instrument is contained in a small case which weighs 24 lb. A 2¼ in. dia. Thallium activated Sodium Iodide Crystal is employed as its detecting element. For complete information write the company at 2235 So. La Brea Ave., Los Angeles 16, Calif.

Aluminum Pipe Couplings

New aluminum Gruvagrip couplings and fittings for grooved aluminum pipe are announced by Gustin-Bacon Manufacturing Co. These new products were developed as a result of increased production of aluminum pipe, which is readily available today.

Aluminum Gruvagrips and fittings are available in 2, 4, 6 and 8-in. sizes.

The new couplings, according to Gustin-Bacon, remain leakproof under end pulls up to 46,000 lb; permit layout misalignment up to three degrees; withstand temperatures between 200 degrees F. and minus 65 degrees F.

They can be removed and re-used repeatedly.

Complete information may be obtained from the manufacturer at 210 West Tenth Street, Kansas City 6, Mo.

— *Announcements* —

Joel A. Fitts, sales engineer, retired recently after more than 38 years with **The Electric Storage Battery Co.** He was associated with the firm's Chicago branch office in the sales and service of industrial storage batteries.

The **Paul Weir Co.** has announced that in the future **Mines Engineering Co.** will be operated as a division of Paul Weir Co. **Louis K. von Perbandt** is retiring as president of Mines Engineering Co. because of impaired health, but continues as consultant for the company. New officers will be **Paul Weir,** president; **John P. Weir,** vice-president; **George H. Chapman,** vice-president, and **Hollis B. Cain,** vice-president.

Denver Equipment Co. announces the opening of a new office in Salt Lake City, Utah. **J. G. Uzelac,** manager of Deco's Chicago office for the past several years, will head the new office.

Ludow-Saylor Wire Cloth Co. of St. Louis has acquired the assets of Star Wire Screen and Iron Works of Los Angeles, and will operate this establishment under the name of Star Wire Screen & Iron Works, Inc., at the old location, 2515 San Fernando Road. The newly acquired company manufactures wire screens and wire cloth.

Atlas Powder Co. has elected **D. J. C. Copps** a vice-president in charge of the company's explosives, industrial finishes and engineering departments. Copps has been general manager of the explosives department since February, 1953, a post in which he is succeeded by **W. Clayton Lytle.**

William J. Klein, manager of the Minneapolis branch, Tractor Division, **Allis-Chalmers Mfg. Co.,** has been named vice-president and general sales manager of the Tractor Division, according to an announcement by W. A. Roberts, president.

Vertner S. Kenerson is now representing **Flexible Steel Lacing Co.** in the Virginia territory so ably covered for a number of years by Warren Paulson. Paulson, who also represents the company in Ohio and West Virginia, will now cover eastern Kentucky as well.

Hercules Powder Co. announces the retirement of **John H. Horlick, Jr.,** manager of the technical service division of the Explosives Department. Horlick is retired after 39 years of service with the company.

New and expanded facilities have been occupied by the Industrial Sales Division of **Western Machinery Co.** in Denver, Colo. Long located at 1004 Speer Blvd., the firm moved into new quarters at 2400 West Seventh Ave. early in December.

Walter F. Deming has been elected president of the **Deming Co.,** succeeding his father, G. Ramsden Deming, who died early in December. The new president is the fifth Deming to head the pump manufacturing firm since it was founded in Salem, Ohio, in 1890.

Daniel J. Cockrell has been appointed sales manager for **Magnetic Engineering and Manufacturing Co.,** producers of magnetic separators, magnetic pulleys and lifting magnets.

Koppers Co., Inc., has purchased the business of American Ore Reclamation Co. Its sintering activities will be conducted by the Freyn Department of Koppers Engineering and Construction Division.

Madison L. Crawford has been appointed advertising manager of **Frank G. Hough Co.**

H. K. Porter Co., Inc., Pittsburgh, has announced acquisition of **The Alloy Metal Wire Co.,** according to T. M. Evans, president of Porter. Operations will continue as The Alloy Metal Wire Co., Division of H. K. Porter Co., Inc.

Index to Advertisers

Here's versatile mining (and lubrication) in action!

● Coal is moved out fast when the continuous mining machine, shown above, goes into action in a midwest mine. This versatile machine literally chews coal from the face and loads it without preliminary cutting or shooting.

Here, too, is versatile lubrication in action. Two grades of SUPERLA Mine Lubricants (an oil and a grease) handle all of the major lubricant and hydraulic oil requirements of this large machine. Because these versatile products are fluid at low temperatures and resist thinning at machine-operating temperatures, they assure protective lubrication both when the machine is started cold and during long periods of continuous operation.

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